



Installation, Setup and Operation **INSTRUCTIONS**



for

SUNNEN® VERTICAL HONING MACHINE

Models: **SV-410**



READ THE FOLLOWING INSTRUCTIONS THOROUGHLY AND CAREFULLY BEFORE UNPACKING,
INSPECTING, OR INSTALLING THE SUNNEN® SV410 VERTICAL HONING MACHINE.

SUNNEN® AND THE SUNNEN LOGO ARE REGISTERED TRADEMARKS OF SUNNEN PRODUCTS COMPANY.

GENERAL INFORMATION

The Sunnen® equipment has been designed and engineered for a wide variety of parts within the capacity and limitation of the equipment. With proper care and maintenance this equipment will give years of service.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY AND THOROUGHLY BEFORE UNPACKING, INSPECTING, OR INSTALLING THIS EQUIPMENT.

IMPORTANT: Read any supplemental instructions BEFORE installing this equipment. These supplemental instructions give you important information to assist you with the planning and installation of your Sunnen equipment.

Sunnen Technical Service Department is available to provide telephone assistance for installation, programming, & troubleshooting of your Sunnen equipment. All support is available during normal business hours, 8:00 AM to 4:30 PM Central Time. Emergency breakdown support is available on a 24 hour / 7 day basis.

Review all literature provided with your Sunnen equipment. This literature provides valuable information for proper installation, operation, and maintenance of your equipment. Troubleshooting information can also be found within the Instructions. If you cannot find what you need, call for technical support.

Where applicable, programming information for your Sunnen equipment is also included. Most answers can be found in the literature packaged with your equipment.

Help us help you. When ordering parts, requesting information, or technical assistance about your equipment, please have the following information available:

- Have ALL MANUALS on hand. The Customer Services Representative or Technician will refer to it.
- Have Model Number and Serial Number printed on your equipment Specification Nameplate.
- Where Applicable: Have Drive model and all nameplate data. Motor type, brand, and all nameplate data.

For Troubleshooting, additional information may be required:

- Power distribution information (type - delta, wye, power factor correction; other major switching devices used, voltage fluctuations)
- Installation Wiring (separation of power & control wire; wire type/class used, distance between drive and motor, grounding).
- Use of any optional devices/equipment between the Drive & motor (output chokes, etc.).

For fast service on your orders call:

Sunnen Automotive Customer Service toll free at: 1-800-772-2878

Sunnen Industrial Customer Service toll free at: 1-800-325-3670

Customers outside the USA, contact your local authorized Sunnen Distributor.

Additional information available at: <http://www.sunnen.com> or e-mail: sunnen@sunnen.com

NOTE: Sunnen reserves the right to change or revise specifications and product design in connection with any feature of our products contained herein. Such changes do not entitle the buyer to corresponding changes, improvements, additions, or replacements for equipment, supplies or accessories previously sold. Information contained herein is considered to be accurate based on available information at the time of printing. Should any discrepancy of information arise, Sunnen recommends that user verify the discrepancy with Sunnen before proceeding.

ESD PREVENTION REVIEW

Let's review the basics of a sound static control system and its effective implementation. First, in the three step plan:

1. Always ground yourself when handling sensitive components or assemblies.
2. Always use a conductive or shielded container during storage or transportation. These materials create a Faraday cage which will isolate the contents from static charges.
3. Open ESD safe containers only at a static safe work station.

At the static safe work station, follow these procedures before beginning any work:

- A. Put on your wrist strap or foot grounding devices.
- B. Check all grounding cords to make sure they are properly connected to ground, ensuring the effective dissipation of static charges.
- C. Make sure that your work surface is clean and clear of unnecessary materials, particularly common plastics.
- D. Anti-static bubble wrap has been included for use at the machine when an ESD safe workstation is not available.

You are now properly grounded and ready to begin work. Following these few simple rules and using a little common sense will go a long way toward helping you and your company in the battle against the hazards of static electricity. When you are working with ESD sensitive devices, make sure you:

GROUND
ISOLATE
NEUTRALIZE

SUNNEN® LIMITED PRODUCT WARRANTY

Sunnen® Products Company and its subsidiaries (SPC) warrant that all new SPC honing machines, gaging equipment, tooling, and related equipment will be free of defects in material and/or workmanship for a period of one year from the date of original shipment from SPC.

Upon prompt notification of a defect during the one-year period, SPC will repair, replace, or refund the purchase price, with respect to parts that prove to be defective (as defined above). Any equipment or tooling which is found to be defective from improper use will be returned at the customer's cost or repaired (if possible) at customer's request. Customer shall be charged current rates for all such repair.

Prior to returning any SPC product, an authorization (RMA#) and shipping instructions must be obtained from the Customer Service Department or items sent to SPC will be returned to the customer.

Warranty Limitations and Exclusions This Warranty does not apply to the following:

- Normal maintenance items subject to wear and tear: (belts, fuses, filters, etc).
- Damages resulting from but not limited to:
 - › Shipment to the customer (for items delivered to customer or customer's agent F.O.B., Shipping Point)
 - › Incorrect installation including improper lifting, dropping and/or placement
 - › Incorrect electric power (beyond +/- 10% of rated voltage) including intermittent or random voltage spikes or drops
 - › Incorrect air supply volume and/or pressure and/or contaminated air supply
 - › Electromagnetic or radio frequency interference from surrounding equipment (EMI, RFI)
 - › Storm, lightning, flood or fire damage
 - › Failure to perform regular maintenance as outlined in SPC manuals
 - › Improper machine setup or operation causing a crash to occur
 - › Misapplication of the equipment
 - › Use of non-SPC machines, tooling, abrasive, fixturing, coolant, repair parts, or filtration
 - › Incorrect software installation and/or misuse
 - › Non-authorized customer installed electronics and/or software
 - › Customer modifications to SPC software

THE LIMITED WARRANTY DESCRIBED HEREIN IS EXPRESSLY IN LIEU OF ALL ANY OTHER WARRANTIES. SPC MAKES NO REPRESENTATION OR WARRANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER MATTER. SPC IS NOT RESPONSIBLE FOR THE IMPROPER USE OF ANY OF ITS PRODUCTS. SPC SHALL NOT BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCLUDING BUT NOT LIMITED TO: LOSS OF USE, REVENUE, OR PROFIT. SPC ASSUMES NO LIABILITY FOR PURCHASED ITEMS PRODUCED BY OTHER MANUFACTURERS WHO EXTEND SEPARATE WARRANTIES. REGARDLESS OF ANY RIGHTS AFFORDED BY LAW TO BUYER, SPC'S LIABILITY, IF ANY, FOR ANY AND ALL CLAIMS FOR LOSS OR DAMAGES WITH RESPECT TO THE PRODUCTS, AND BUYER'S SOLE AND EXCLUSIVE REMEDY THEREFORE, SHALL IN ALL EVENTS BE LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THAT PORTION OF THE PRODUCTS WITH RESPECT TO WHICH A VALID CLAIM IS MADE.

Shipping Damages

Except in the case of F.O.B., Buyer's destination shipments, SPC will not be liable for any settlement claims for obvious and/or concealed shipping damages. The customer bears the responsibility to unpack all shipments immediately and inspect for damage. When obvious and/or concealed damage is found, the customer must immediately notify the carrier's agent to make an inspection and file a claim. The customer should retain the shipping container and packing material.

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Any alteration or reverse engineering of the software is expressly forbidden and is in violation of this agreement.

SPC reserves the right to update the software covered by this agreement at any time without prior notice and any such updates are covered by this agreement.

SAFETY INSTRUCTIONS

READ FIRST

This machine, like any equipment, may be dangerous if used improperly. Please read all warnings and instructions before attempting to use this machine.

Always disconnect power at main enclosure before servicing machine.¹

Always wear eye protection when operating this machine.

NEVER open or remove any machine cover or protective guard with power "ON."

Always disconnect power at main enclosure before servicing this equipment.¹

DO NOT attempt any repair or maintenance procedure beyond those described in this book. Contact your Sunnen® Field Service Engineer or Technical Services Representative for repairs not covered in these instructions.

Due to the wide variety of machine configurations, all possibilities cannot be described in these instructions. Instructions for safe use and maintenance of optional equipment ordered through Sunnen, will be provided through separate documentation and/or training provided by your Sunnen Field Service Engineer or Technical Services Representative.

DO NOT attempt to defeat any safety device on this machine or on any of the optional equipment.

If specially built automation components are added to this system, be sure that safety is not compromised. If necessary, obtain special enlarged work area safety system from Sunnen Products Co.

 Indicates CE version ONLY.

¹ DO NOT touch electrical components until main input power has been turned off and *CHARGE* lamps are extinguished. **WARNING:** The capacitors are still charged and can be quite dangerous.


IMPORTANT NOTE

The temperature requirements of the Sunnen® SV410 Vertical Honing Machine have been established as 35 degrees C (95 degrees F). Above this temperature, an optional cooler will be available to handle temperatures from 35° to 46° C (95° to 115° F). IT IS NOT recommended that the SV Machine be operated at temperatures above 46° C (115° F). Sunnen Products Company warrants the SV Machine for operating environments up to 35°C (95° F). For operating environments of 35° to 46° C (95° to 115° F) the warranty only applies if the optional cooler is installed on the Machine. No warranty coverage is offered for operating environments above 46° C (115° F).

INTRODUCTION

This Instruction Manual provides information required to install, operate, and maintain Sunnen® Vertical Honing Machine.

When ordering parts for, or requesting information about your Machine, include model and serial numbers, located on Electrical Enclosure of your Machine.

In this book the  symbol indicates steps or information that are only for CE version of this machine. The CE version is constructed to meet highest level of safety standards as required by the European Machinery Directive. Required for European market, this CE version is available for any customer. The regular version of this machine is quite safe for any operator exercising a normal degree of caution associated with machine tool use. The CE version provides an extra level of protection by minimizing risks of operator carelessness.

The SV410 Vertical Honing Machine is to be used for finishing bores in small workpieces. In finishing bores, this machine can achieve any or all of following results: fast stock removal, consistent final size, a high degree of cylindrically, fine surface finish. To achieve best results and ensure safe operation, ONLY Sunnen Tools and Abrasives are to be used in the SV410.

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GENERAL INFORMATION & SPECIFICATIONS

Sunnen® Vertical Honing Machines - SV410

Diameter Range (ID)¹: 19 - 200 mm (.75 - 8 in.)
Max. Workpiece Weight¹: 900 kg (2000 lbs.)
Max. Workpiece Length¹: 710 mm (28 in.)
Workpiece Envelope: 1016 x 1778 mm (40 x 70 in.)
Carriage Travel (X Axis): 1155 mm (45.4 in.)
Stroke Travel (Z Axis)¹: Up to 762 mm (30 in.)
Stroke Speed (Z Axis): 10-160 spm
Stroke Motor: 7,5 kW (10 hp); DC Servo
Spindle Speeds: 90 to 600 rpm
Spindle Motor: 7,5 kW (10 hp)
Thrust: 1360 kg (3000 lbs.) maximum
Feed - Rotary: Up to 25,4 N·m (224.8 lb-in.) maximum torque
Coolant System²: Optional

Sump Pump Motor²: 0,5 kW @ 225 LPM/2m head
 (.67 hp @ 68 GPM/6ft head)
Coolant Requirements: Sunnen Industrial Honing Fluids
Work Area (View A)³: 3842 W x 4075 D x 3065 H mm
 (151 x 160 x 121 in.)
Floor Space (Machine Foot Print): 2546 W x 2309 D x 2436 H mm
 w/o Optional Coolant System (100 x 91 x 96 in.)
Floor Weight (Dry): 4350 kg (9590 lbs.)
Floor Load: 1500 kg/sq. meter (301 lbs./sq. ft)
Electrical Requirements: 460V, 60Hz, 3Ph, 44A;
 400V, 50Hz, 3Ph; 46A
Color: Black / Stainless Steel
Noise Emission: Less than 72 dB(A) continuous
 Less than 78 dB(A) peak
 Load (max. noise) condition in
 a typical factory environment.

¹ Diameter range, length range, and workpiece weight are contingent on workpiece and application.

² The SV410 does NOT come with a Coolant System. The Coolant System is an option and MUST be order separately.

³ Work Area includes Machine Floor Space plus clearance for operator to move around machine.

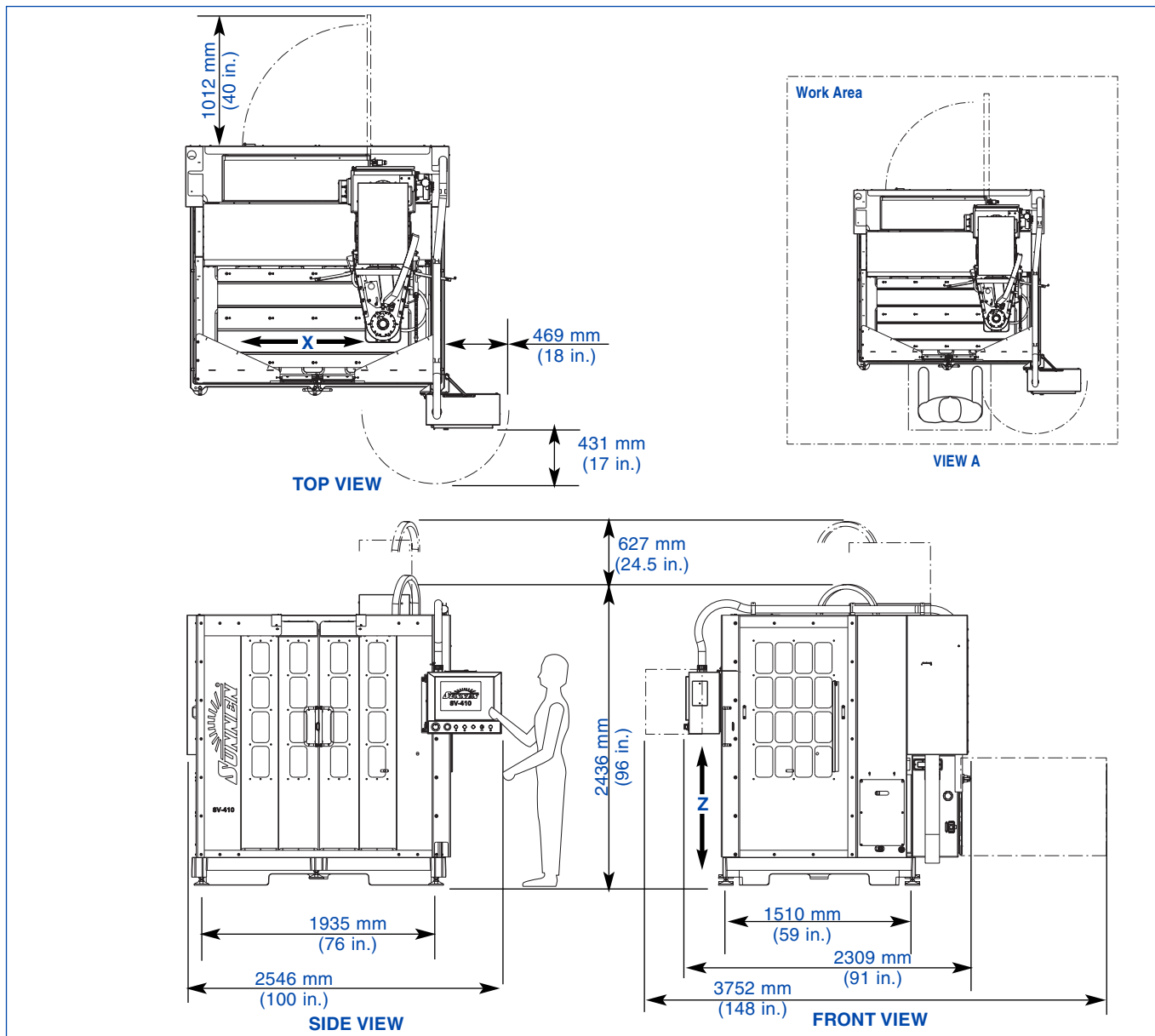


FIGURE 1-A, Floor Plan Layout (System Configuration)

SECTION 1

INSTALLATION

GENERAL

Consult this section when unpacking, inspecting, and installing Sunnen® Vertical Honing Machine (see Figure 1-1). Hereafter referred to as the machine.

TOOLS & MATERIALS

The following tools and materials are required for unpacking and installing of your Machine:

Knife	Hex Wrenches
Hammer	Open End Wrenches
Crow Bar	Cleaning Solvent
Tin Snips	Screwdriver (Std)
Slip Joint Pliers	Forklift

INSTALLATION

Read the following instructions carefully and thoroughly before unpacking, inspecting and installing your Machine. All references to right and left in these instructions are, unless otherwise noted, as seen by operator as one looks at Machine or assembly being described (refer to Figure 1-1).

NOTE: When ordering parts for, or requesting information about your Machine, include Model and Serial Numbers printed on Nameplate.



FIGURE 1-1, Vertical Honing Machine

1. Move Machine to staging/unpacking area.
2. Remove shipping carton and plastic wrap. (Cut, remove and discard shipping bands.)
3. Remove all loose components.
4. Check all components against packing list.
5. Inspect Machine and components for dents, scratches, or damage resulting from improper handling, by carrier. If damage is evident, immediately file a claim with carrier.

CAUTION

Weight is approx. 4350 kg (9590 lb).

6. Remove Bolts securing Machine to Skid.
7. Using a forklift remove machine from skid and move to desired location and lower into place (see Figure 1-2).

NOTE: Machine should be located on a leveled concrete floor away from heavy traffic. Allow at least 1m (38in.) around enclosure to any adjacent equipment and walls. Refer to Figure 1-A, Floor Plan Layout.

8. Level and stabilize Machine by placing a millwright's level on ground Table Base (see Figure 1-3). Machine needs to be leveled both from front to back and left to right.

NOTE: Machine does not need to be bolted to floor but should be set on 1/2" thick steel pads.

- Begin by screwing ALL six (6) Adjustable Feet all the way into the Table Base (until table base is resting on the floor).

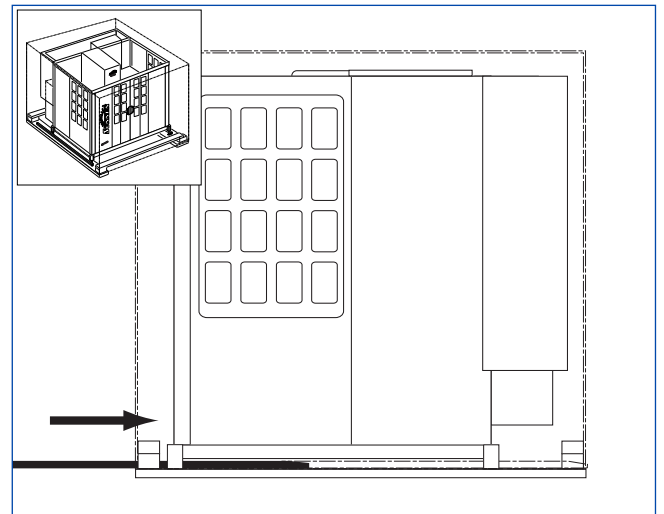


FIGURE 1-2, Fork Lift

- Then check to see if any of the feet are not touching the floor or touching the floor only loosely. If so, bring foot down to just touch floor.
- Place Level front to back on right side of table and adjusting Leveling Bolts in each of the right front & rear feet as required, until table base is within 0,0003 m/m.
- Re-check and adjust any feet that are loose or not touching, until they just touch the floor.
- Repeat for left side of table.
- Re-check and adjust any feet that are loose or not touching, until they just touch the floor.
- Move to front of table and check front of table left to right for level. Adjusting Leveling Bolt in which ever of the feet is lowest as required, until table base is within 0,0003 m/m.
- Adjust center Leveling Bolts at front of table until it just touches the floor.
- Move to rear of table and check rear of table left to right for level. Adjusting Leveling Bolt in which ever of the feet is lowest as required, until table base is within 0,0003 m/m.

NOTE: In most cases the lowest foot should be on the same side in the rear as the one that was just adjusted on the front of the table.

- Adjust center Leveling Bolts at rear of table until it just touches the floor.
- Recheck table front to back and left to right.
- Tighten Jam Nuts on all the feet to lock bolts in place.
- After leveling Table Base using by adjusting the feet; place shims under table base wherever the base is not in direct connect with the floor.

NOTE: This is very important. If Table Base is not supported it may bowl when the weight of the fixture and workpiece are installed.

9. ATTENTION - Remove steel Cross Bracket that supports machine during shipping (see Figure 1-4).

10. ATTENTION - Remove Wooden Support, added to Machine to restrict movement of Column during transit (refer Figure 1-4).

11. ATTENTION - Raise Column. Remove steel Shipping Bracket located behind carriage Linear Rails Cover and install stainless cover (refer Figure 1-4).

12. ATTENTION - Remove bubble wrap from under Stroker Motor on base of column and remove protective wrap from cover (refer Figure 1-4).

13. ATTENTION - The Cable Track has been disconnected from column for shipping purposes. Reattach Cable Track to top of column using bolt and washer supplied (see Figure 1-5).

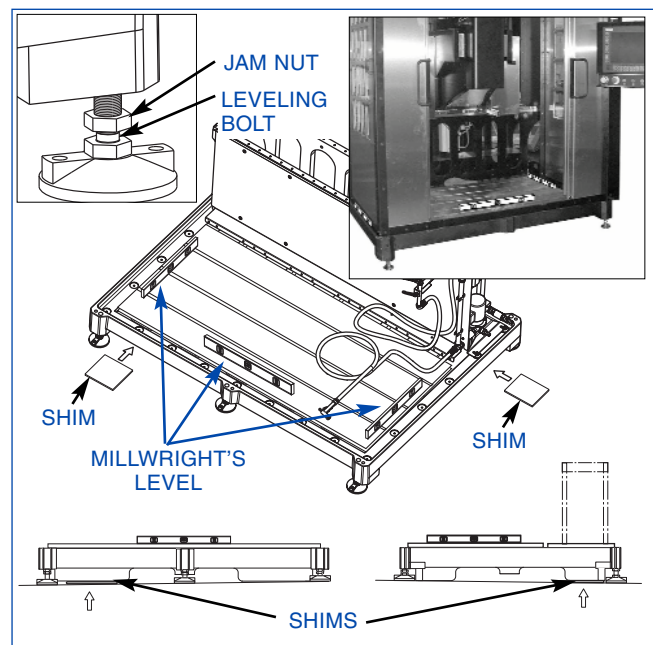


FIGURE 1-3, Leveling Bolts

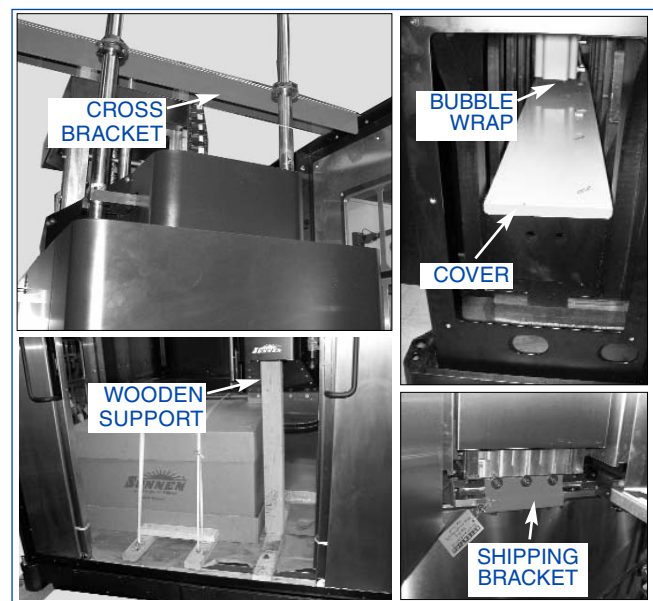


FIGURE 1-4, Shipping Brackets

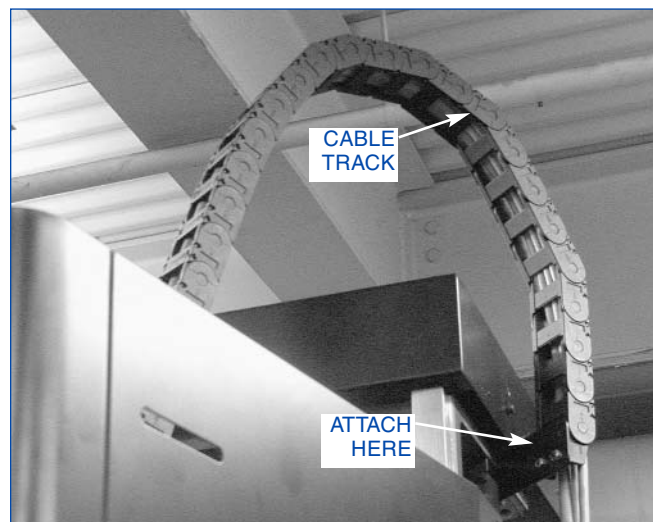


FIGURE 1-5, Cable Track

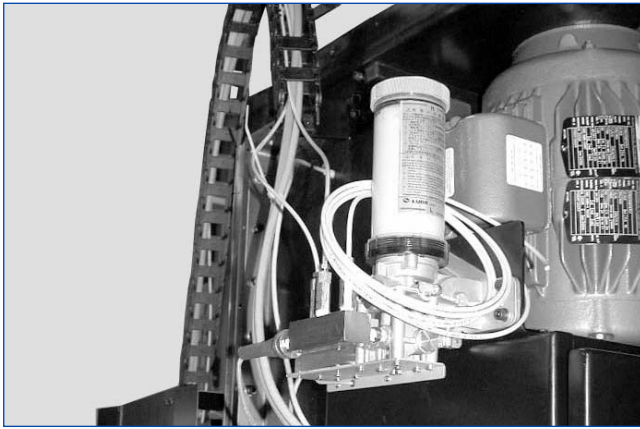


FIGURE 1-6, Lubricating System

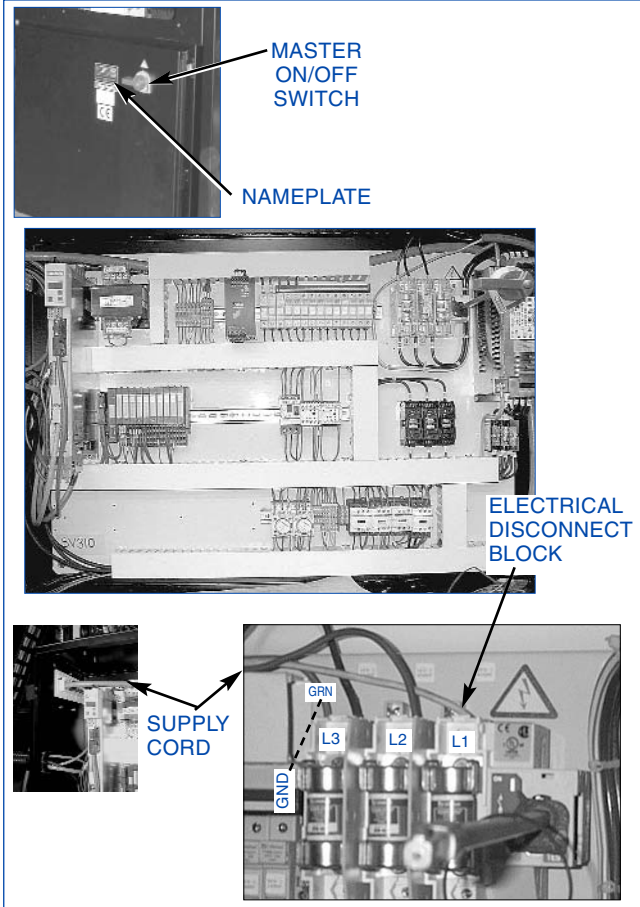


FIGURE 1-7, Electrical Connection

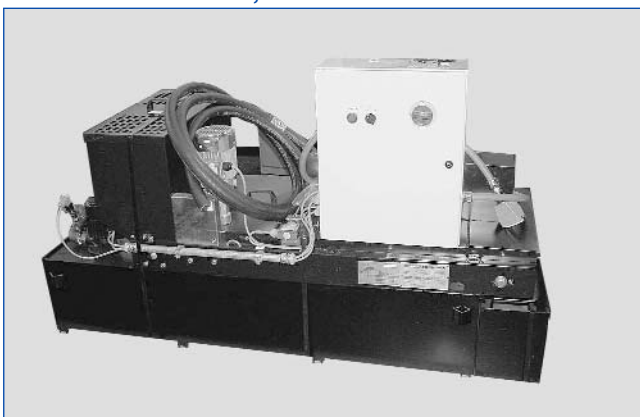


FIGURE 1-8, Coolant System (opt.)

14. Wipe all protective shipping oil and grease from Machine. (Clean rust preservative from way bars and any other bright metal surfaces.)

15. If applicable: Position optional coolant system on right side of base.

LUBRICATING SYSTEM

The machine is equipped with an automatic grease lubricating system.

Grease Reservoir is filled at the factory with Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent) (see Figure 1-6). System is equipped with a Pressure Switch, which flashes a warning on the operator display screen when the level/pressure drops below minimum requirement.

ELECTRICAL

All wiring is to be performed by a competent, Licensed Electrician in accordance with all local, state, and federal codes and regulations; along with any special information provided on machine nameplate or electrical specification plate (see Figure 1-7).

CAUTION

This machine was wired for 460VAC. If it is to be run at 400VAC the taps on the control transformer 1T must be changed. All wiring is to be performed by a competent, licensed electrician in accordance with all local, state and federal codes and regulations. **FAILURE TO COMPLY CAN RESULT IN PERSONAL INJURY AND DAMAGE TO THE MACHINE.**

WARNING

All wiring and electrical equipment service should be performed by authorized personnel ONLY.

CAUTION

Do not attempt to connect machine if supply voltage is not within acceptable limits as noted on nameplate or electrical specification plate. If supply voltage is not within these limits **MACHINE WILL BE DAMAGED.**

Verify supply voltage is same as voltage on Machine Nameplate or Electrical Specifications Plate.

ELECTRICAL CONNECTION

A pre-drilled hole has been provided in Electrical Enclosure for Electrical Supply Cord (not supplied). Connect Cord as follows (refer to Figure 1-7).

WARNING

Residual Voltage exists for 2-3 minutes after Master ON/OFF Switch is turned OFF. Before working inside Enclosure, wait for all fans to stop running to allow drives to discharge.

1. Unlock Door to Electrical Control Enclosure. Loosen Safety Latches on door(s) to enclosure, using a screwdriver.

CAUTION

Door is equipped with lockable Safety Door Latch. Door should be closed and latched during operation to prevent accidental interruption of operation from doors being opened. Door Latch should be Locked-Out and Tagged during servicing to prevent machine from being powered up.

2. Turn Master ON/OFF Switch to OFF position and open Door. (Door WILL NOT open unless Master ON/OFF Switch is in OFF position.)
3. Open Door to enclosure.

WARNING

You must use the hole provided. Drilling any new holes in the electrical enclosure may void the warranty.

4. Remove hole plug located on top, left side of the enclosure. Then install an oil tight fitting.
5. Insert Electrical Supply Cord through Oil Tight Fitting and route to Electrical Disconnect Block.
6. Strip 254 mm (10 in) off cable's outer jacket.
7. Strip 6 mm (1/4 in) of insulation off each wire.
8. Connect Green Wire (GRN) to Terminal PE on Electrical Disconnect Switch (Earth Ground).
9. Connect other three wires to Disconnect Block (1DISC) as noted on Block (L1, L2, L3).
10. Route and secure Cord inside of Enclosure.
11. Tighten Oil Tight Fitting.
12. Close and secure/lock Door to Enclosure.
13. Route and connect Electrical Supply Cord to factory main power source.
14. Turn ON Master ON/OFF Switch.

COOLANT SYSTEM (Optional)

The machine comes with a Sump Pump and a small Reservoir. Because of the numerous application possibilities the machine is not supplied with a coolant system, optional Coolant Systems are available. Placement and system requirements will vary with coolant system used. Sunnen provides several optional coolant systems (see Figure 1-8). Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services for available systems or before installing another manufacturer's system.

IMPORTANT

Operating Instructions and Repair Parts Catalogs for the optional Coolant Systems are supplied by the systems manufacturer.

Fill Coolant Reservoir with either Sunnen Industrial Honing Oil or Sunnen Water-Based Coolant. Refer to Section 4.

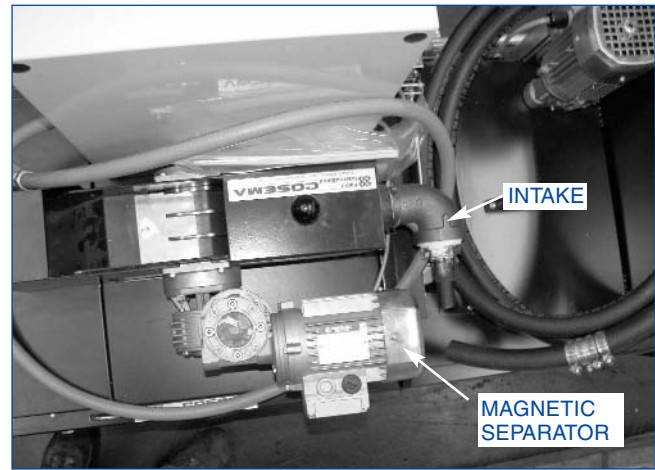


FIGURE 1-9, Magnetic Separator

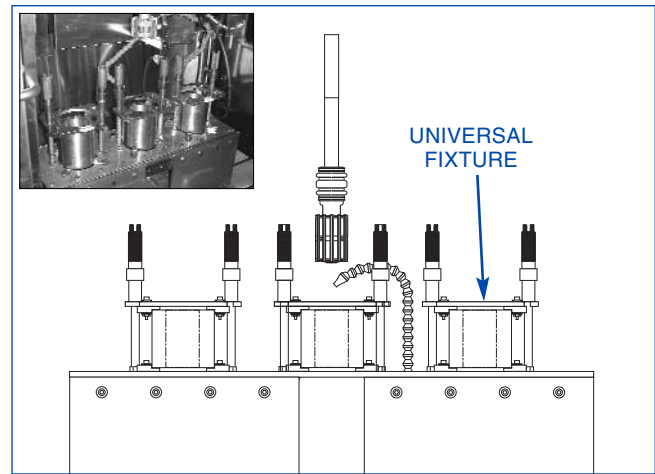


FIGURE 1-10, Universal Fixture

COOLANT SYSTEM CONNECTION

The machine comes with a Sump Pump and a small Reservoir. Intake and Outlet Hose Barbs are provided for connecting optional Coolant System (see Figure 1-8):

CAUTION

Supply coolant pressure should not exceed 20 psi (0,14 MPa).

MAGNETIC SEPARATOR (Optional)

Like the Coolant System, the machine is not supplied with a magnetic separator (see Figure 1-9). If your application produces large amounts of metal residue, it is recommended that you employ either or both a magnetic separator and filter system. Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services for available options or before installing another manufacturer's system.

SPECIAL FIXTURE (Optional)

Because of the numerous applications possibilities the machine is not supplied with any fixturing, optional fixtures are available (see Figure 1-10). Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services.

OPERATIONAL CHECK

Read Sections 1, 2 and 3 thoroughly and carefully before performing the Operational Check.

NOTE: Power up and start machine to check for proper operation.

1. Release E-STOP and press POWER ON Button.

NOTE: When machine is powered up it should open the “Sunnen” software.

2. Once machine is through initializing, press “F1 Setup Menu.”

3. Then press “F2 Install Setup,” and follow directions on display screen.

4. Once a setup is install; at Main Menu press “F2 Run Menu.”

5. In run settings you can toggle the coolants lines to check the rotation of the Sump Pump Motor. (Rotation of Shaft should be as shown on Motor Cover.)

6. If rotation is incorrect, turn OFF power to Machine and reverse any two wires (red, white, or black) of electrical supply cord, where they connect to Disconnect Block.

7. Operate Machine and check rotation of optional equipment according to Installation Instruction package with optional equipment.

8. Set up and test all machine functions (refer to Section 3).

9. After unpacking and installing Machine, clean and lubricate (refer to Section: 4, Routine Maintenance).

NOTES

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SECTION 2

PREPARING FOR OPERATION

GENERAL

Consult this section when preparing the Machine for operation.

MAJOR COMPONENTS

Consult the following figure for location of major components on your machine, (see Figure 2-1).

1a. The *Machine Base* is equipped with

1b. *Leveling Bolts* for stabilizing Machine and

1c. *Stainless Steel Guard Doors*.

2a. *Electrical Enclosure*. Located on rear of Machine.

2b. *Column Enclosure*. Located on rear of column.

3a. The *Operator Station* houses all electronic hardware and software for hone control. It is also main operator interface with machine.

4a. The *Spindle Carriage* is mounted on

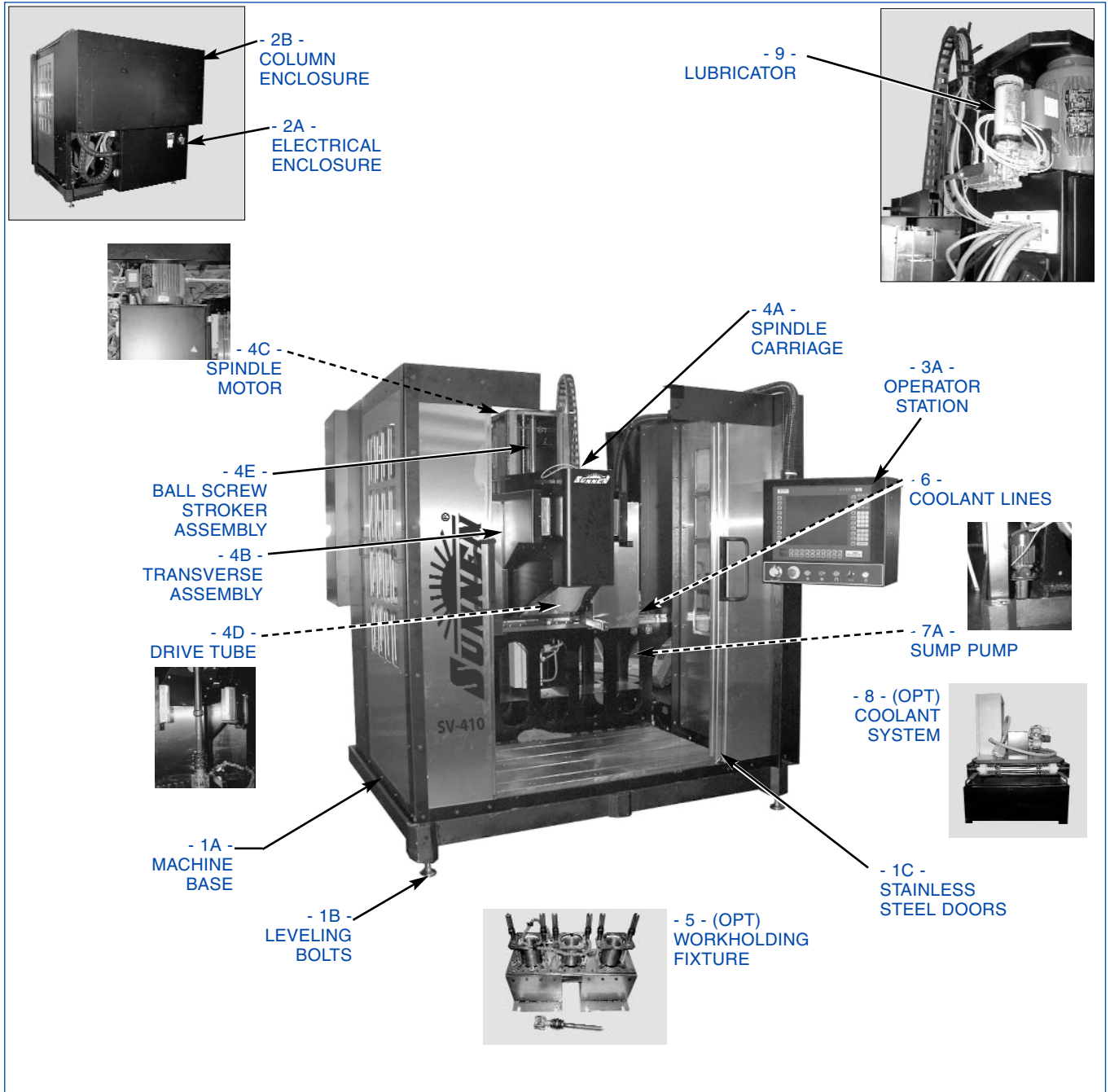


FIGURE 2-1, SV410 Honing Machine

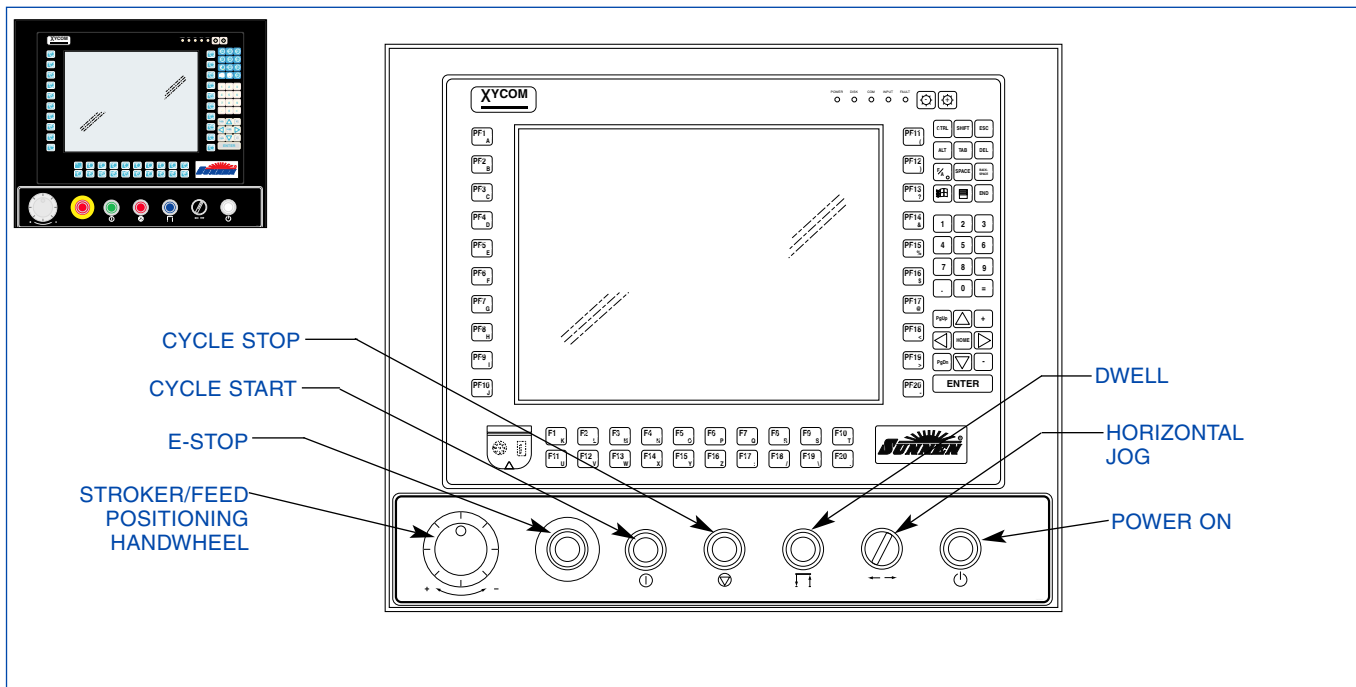









FIGURE 2-2, Front Panel

TABLE 2-1, Operator Controls

SYMBOL	DESCRIPTION	FUNCTION
	STROKER/FEED POSITIONING (Handwheel)	Select either Column A Stroker or Column A Feed on Operator Touch Screen. Column A Stroker - Handwheel can be used to position Tool vertically in bore (up or down). Column A Feed - Handwheel can be used to expand or retract stones in bore. Column A Motion - Handwheel can be used to position carriage horizontally (left or right) on models equipped with optional carriage servo motor.
	E-STOP (Pushbutton, Red)	Shuts-OFF all power to the machine functions. Button must release, before Power ON button can be pushed.
	CYCLE START (Pushbutton, Green)	Switch is used start a honing cycle.
	CYCLE STOP (Pushbutton, Red)	Stops honing cycle.
	DWELL (Pushbutton, Blue)	Switch is used to make stroker dwell while machine is honing. (NOTE: On Run screen, there are 5 marks in bore profile display that represent five locations in bore. Using up and down ARROW keys, you can move this marker to place where you would like to dwell. When you press dwell button, stroker will dwell in location that you selected with arrow keys for 2 seconds.) For continuous dwell, hold Dwell Button in for desired length of time.
	HORIZONTAL JOG (Selector Switch)	Switch moves Stroker Carriage left or right to align tool in bore.
	POWER ON (Pushbutton, White)	Turns ON control power to the machine. After E-Stop Button is released; Power ON button must be pushed to turn ON Control Power.
	"F" KEYS	These keys are used for a variety of functions, as indicated across the bottom of the display screen.
	KEYPAD	Numeric keypad is used to enter information into the display screen.

- 4b. The *Transverse Column Assembly* which allows the Spindle Carriage to move left or right to align Spindle with bore. It is powered by
- 4c. The *Spindle Motor* which by way of a belt, drives
- 4d. The *Drive Tube* which imparts stroking and rotational motion from spindle to honing tool. Houses feed rod.
- 4e. A *Ball Screw Stroker Assembly* located inside of Column provides stroking power to Spindle Carriage.
- 5. Workholding Fixture (opt)
- 6. The *Adjustable Coolant Lines* allows manual regulation of honing fluid flow through the
- 7a. The *Sump Pump* pumps coolant from the machine base reservoir.
- 7b. A *Coolant Interface* allows an optional coolant system to be attached to the machine.
- 8. A *Coolant System* (opt) can be added to ensure debris is removed from coolant.
- 9. An automatic *Lubricator* provides grease to the major components of the machine.

OPERATOR CONTROLS

For the location and function of the operator controls refer to Figure 2-2 and Table 2-1.

SAFETY SYMBOLS

For a description of safety symbols used on this machine, refer to Table 2-2.

WORKHOLDING FIXTURE

Install and align Optional Workholding Fixtures according to instructions packaged with fixtures supplied for your particular application.

NOTE: Fixtures used on these machines are custom made for each job. Follow installation and alignment procedures packaged with your fixture.

HONING TOOL

Refer to Sunnen Industrial or Automotive Honing Supplies Catalogs for all your honing needs

CAUTION

Use of tooling other than Sunnen tooling will render all of features of computerized honing system useless, due to fact that machine and all its parameters are calibrated to Sunnen Tooling only.

NOTE: On SETUP screen, there is a TOOL option. This option allows operator to select type of tool that will be used. The correct tool family needs to be selected in order for feed system to operate properly

Sunnen offers a wide verity of tooling options within the diameter range of this machine. Including:

CK/CV-Series Hone Heads 51-203mm









GHSS/GHTS-Series Hone Heads 38-141mm

The following options require a mandrel adapter:

P20/28-Series Hone Heads 19-152mm

MPS-Series Hone Heads 50-216mm

TABLE 2-2, Safety Symbols

SYMBOL	DESCRIPTION	FUNCTION
	Warning Label	Warns that an <i>electrical hazard</i> exists.
	Label	Designates this machine is “CE” compliance.
	Warning Label	Warns that no drilling is allowed. Drilling any new holes may void warranty.
	Warning Strip	Warns that a <i>physical hazard exists</i> , and that proper precautions should be taken.
	Caution Label Moving Parts	Warns that a finger hazard exists. Do not touch while stroker is operating.
	Warning Label (Light)	Warns that power must be OFF when belt guard is opened, to prevent injury.
	Warning Label (Safety Glasses)	Warns that safety glasses should be worn at all times when operating this machine.
	Warning Label	General Warning.

HONING TOOL SETUP

When using CK/CV or GHSS/GHTS Series Hone Heads proceed to, Installing Hone Head.

When using P20/P28 Mandrel and CV1010 Mandrel Adapter, proceed with the following steps:

P20/P28 Mandrel & Mandrel Adapter

Following is a setup guide using mandrel adapter.

1. Using an adjustable wrench, turn feed rod in Mandrel Adapter counterclockwise until wedge hook in adapter nose is fully extended.
 2. Slide drive tube end of Mandrel Adapter into drive tube of machine, and tighten set screw into one of holes (see Figure 2-3).
 3. Rotate mandrel adapter by hand until its set screw points toward you.
 4. Insert stones into mandrel.
 5. Pull back on mandrel wedge, using "V" notch in chuck wrench.
 6. If required, place concentric sleeve on mandrel. If runout is excessive during honing, replace sleeve with eccentric sleeve. If runout remains excessive, turn sleeve around.
 7. Insert mandrel into adapter.
- For all "P" series mandrels under 66 mm (2.6 in.), stones should be 90° to right of set screw.
- For all "P" mandrels over 66 mm (2.6 in.), stones should be 90° to left of set screw.
8. Push mandrel up into Adapter until it bottoms, rotate it 1/4 turn to right, and push up until it bottoms again.
 9. Tighten Set Screw securely with chuck wrench.

CV/CK-Series Hone Heads

Install CV/CK-Series Hone Head by sliding Hone Head Drive Tube into Machine Drive Tube; align Locating Screw in Hone Head Drive Tube with one of holes Machine Drive Tube; then, tighten screw (refer to Figure 2-3).

NOTE: Locating Screw can be screwed into hole in lower part of Drive Tube when index lines are in line.

Replacing Stones

To replace stones in CV/CK-Series Hone Head, proceed as follows:

1. Slide Movable Stop to OUT position. Insert Stone Assembly with worn-out stone into fixture and pull lever toward you until stone is free from master stoneholder.
2. Brush chips and grit from Master Stoneholder slots.
3. Move Lever to open position and slide Movable Stop to IN position (see Figure 2-4). Fixture is now ready for inserting new stone.

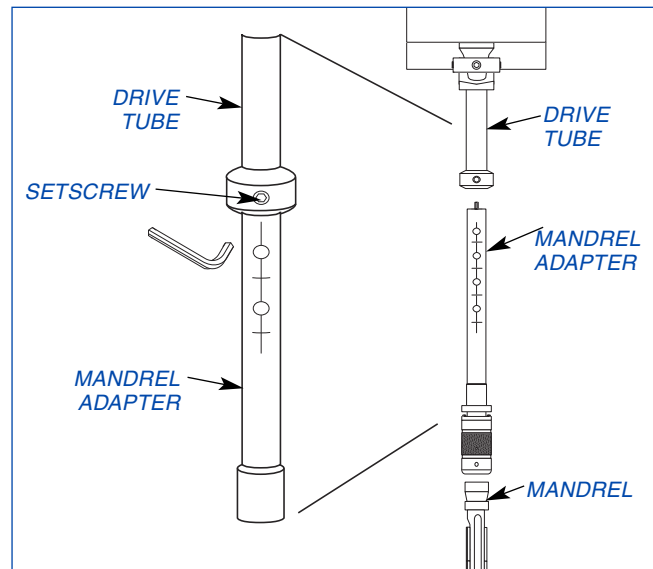


FIGURE 2-3, Install Mandrel Adapter

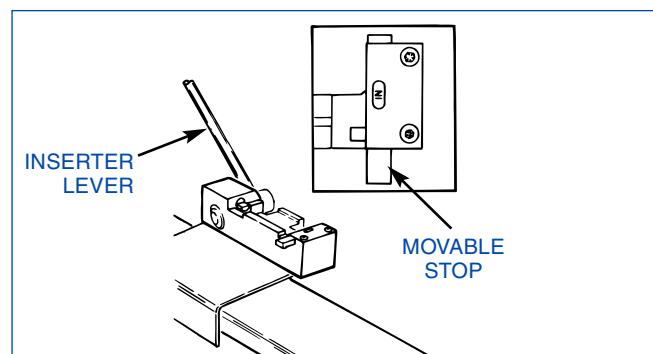


FIGURE 2-4, Open Position

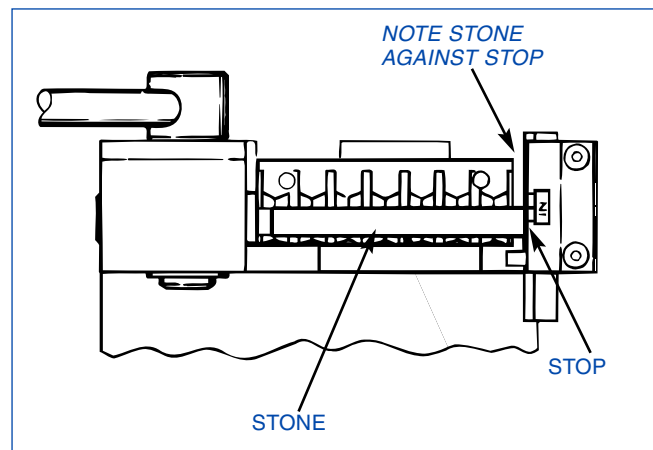


FIGURE 2-5, Install Stone

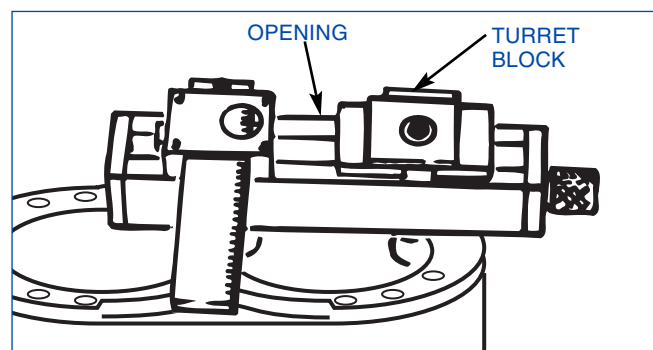


FIGURE 2-6, Setting Gage

4. Place Master Stoneholder in fixture. Brush all loose chips from Stoneholder grooves and slots.

5. Place Stone in Master Stoneholder (see Figure 2-5). Lugs on stone sides should fit into cross slots of Master Stoneholder.

6. Seat Stone in Master Stoneholder by pressing down with fingers. Pull lever forward until Stoneholder hits stop. Stone is now in place.

Install Guide/Stone Shims

7. Place Setting Gage in bore to be honed; then snug, making sure to center (see Figure 2-6).

NOTE: On CK-3155 Setting Gage, make sure proper side of Turret faces Opening. (Gage faces are labeled for tool Choices.)

8. Place Guide/Stone Assembly in Setting Gage with graduated slide set at "0" (see Figure 2-7).

9. Move graduated slide so that pin contacts guide. If pin does not contact guide, add a No. 19 shim and try again. Now add necessary shims as indicated on slide. Looseness less than thickness of one shim is acceptable. Special instructions for using CK-4155 Setting Gage for large hone head in 102-203 mm (4-8 in.) range: Move graduated slide so that pin contacts assembly.

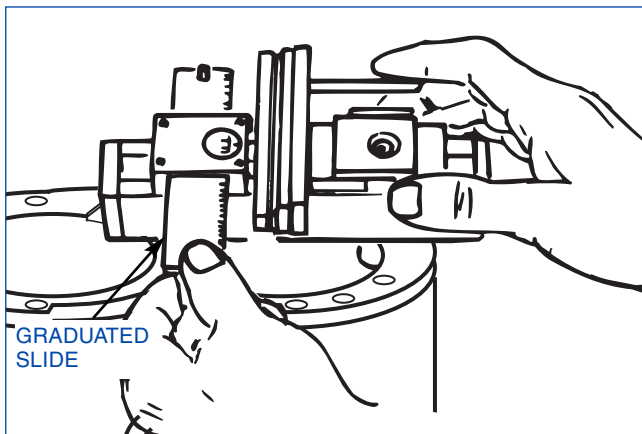


FIGURE 2-7, Main & Centering Guides

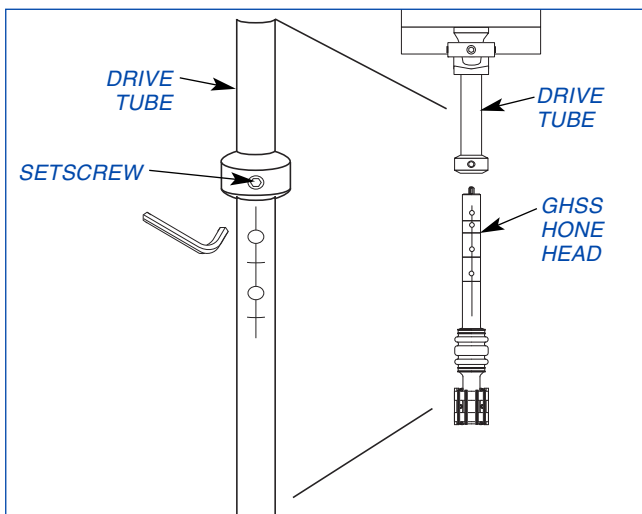


FIGURE 2-8, GHSS Hone Head

If graduated slide reads "15" or less, no additional shims should be added; if slide reads over "15", remove assembly from Gage and add one shim.

NOTE: A properly shimmed assembly will slip into gage easily. Both Guide/Stone Assemblies must have same thickness of shims, and each must fit in Setting Gage when assembled with shims.

10. Rotate Drive Tube until numeral "1" appears on Hone Body. Insert one stone assembly with shims in left-hand set of holes beneath numeral.

11. Insert other shimmed Stone Assembly beneath numeral "2", using procedure above.

12. Insert shimmed Main Guide beneath numeral "3" on Hone Body.

13. Place shimmed Centering Guide beneath numeral "4" on Hone Body.

Alignment Guide

NOTE: DO NOT use alignment guides when honing ported or keyway bores.

14. Place Alignment Guide in setting gage with graduated slide set at "0". Loosen Clamp Screw on alignment guide with hex key wrench and slide to Shoulder. Tighten Clamp and repeat procedure with second alignment guide.

15. Place one of alignment guides in left-hand set of holes above numeral "1" in hone body, so guide and stone are in line.

16. Place other alignment guide in left-hand set of holes above numeral "2" in hone body, so guide and stone are also in line.

GHSS-Series Hone Heads

Sunnen GHSS-Series Single Stage Honing Tools consists of four sets of six (6) to eight (8) spring loaded stoneholders, which utilize Sunnen abrasives.

Install GH-Series Hone Head by sliding Hone Head Drive Tube into Machine Drive Tube; align Locating Screw in Hone Head Drive Tube with one of the holes in the Machine Drive Tube; then, tighten screw (see Figure 2-8).

NOTE: Locating Screw can be screwed into hole in lower part of Drive Tube when index lines are in line.

Install Abrasives:

NOTE: Hone head and tops of stoneholders are marked with corresponding numbers, as are the expander plates. All numbered pieces should be kept together when using this tooling.

Grasp stoneholder in one hand (i.e., GHG14C233-7) and abrasive in the other hand. Lay abrasive in holder with slot in abrasive facing away from holder (see Figure 2-9). Center the abrasive in holder. Using a 5/32" allen wrench, tighten allen head Screw in holder

snugly. Take mounted stoneholder in one hand; look at it lengthwise from one end, into a light to see if there is any light between stoneholder and bottom of abrasive. The abrasive should sit completely flat in the holder.

Install Stoneholders and Expander Plates

Always install stoneholders and expander plates in sets. To install, proceed as follows:

1. Verify the hone head is fully retracted.
2. It is easiest to put two holders and plates into the head at a time, working in a counterclockwise direction, looking down from the universal joint (*see Figures 2-10 & 2-11*).
 - Align angles on expander plate to corresponding angles on cone inside of the tool.
 - Insert two numbered expander plates and load stoneholders into slots, keeping number on top of holder and plate to the left.
 - Grab the bottom of spring of one of the holder and pull it over spring slots in bottom of holder, using the Thumb Spring Tool (*refer to Figure 2-11*). Repeat for second holder.
 - Then, go to top of hone head and pull springs over spring slots in top of holder.
3. Proceed to next two expander plates and stoneholders and *repeat step 2* until the hone head is loaded with plates and holders.

4. Once all plates and holders are loaded in head, expand and retract holders in head several times to ensure all moving parts are seated in head properly.

Remove Stone Holders

When removing stone holders, always remove in pairs. To remove and/or replace holders, proceed as follows (*refer to Figure 2-11*):

1. Grab spring on bottom of head in between mounted clips and pull it down and away from bottom of holder, using thumb spring tool (GH-50). Repeat for second holder.
2. Then, go to top of hone head and pull springs off of the same two holders.
3. Pull the holders out of hone head making sure expander plates stay in the hone head.
4. Fill the empty slots in hone head with new stone holders, and reattach springs.
5. Proceed to next two stone holders and repeat steps.

Truing Stones

Sunnen diamond abrasive honing stones have been pre-ground to a radius and can be used directly from the box. Bore geometry should be monitored as the stones true in.

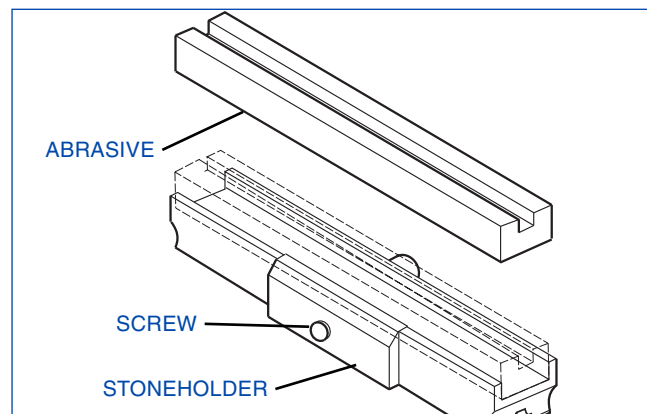


FIGURE 2-9, Install Stones

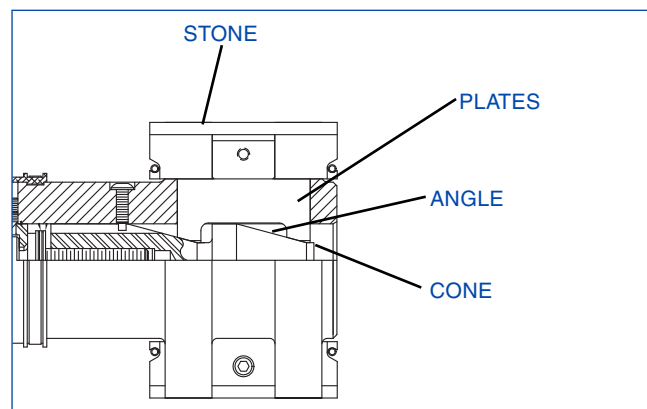


FIGURE 2-10, Install Expander Plates

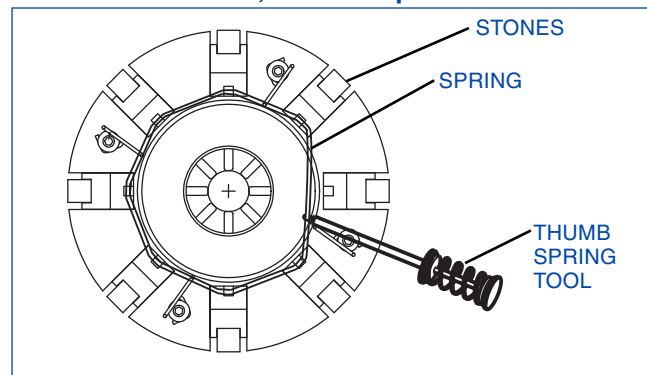


FIGURE 2-11, Install Holders

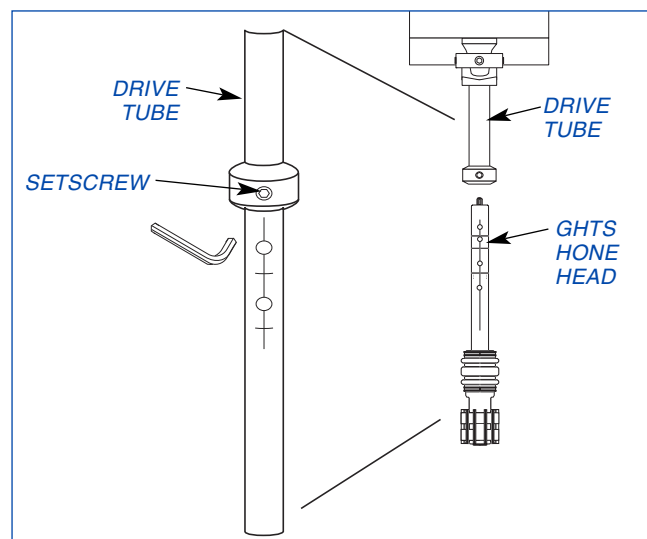


FIGURE 2-12, GHTS Hone Head

GHTS-Series Hone Heads

Sunnen GHTS-Series Two Stage Honing Tool uses Sunnen GH Stone Sets and PHT Brush Sets.

Install GH-Series Hone Head by sliding Hone Head Drive Tube into Machine Drive Tube; align Locating Screw in Hone Head Drive Tube with one of the holes in the Machine Drive Tube; then, tighten screw (*see Figure 2-12*).

NOTE: Hone head and expander plates are marked with corresponding numbers. All numbered pieces should be kept together when using this tooling.

IMPORTANT

Note reference mark on end of cone and on hone body. These marks **MUST** be aligned to ensure cone will be matched to expander plates. **DO NOT** deviate from this orientation.

Install Expander Plates

Before installing stone/brush sets, check to make sure expander plates are in their correct locations (*see Figure 2-13*). Each plate is marked with a number and a letter, which corresponds to mating slot on hone body. Expander plates are angle cut; plates must be installed to match angles of inner cone.

Install Stone/Brush Sets

Always install stones/brushes in as sets. To install, proceed as follows:

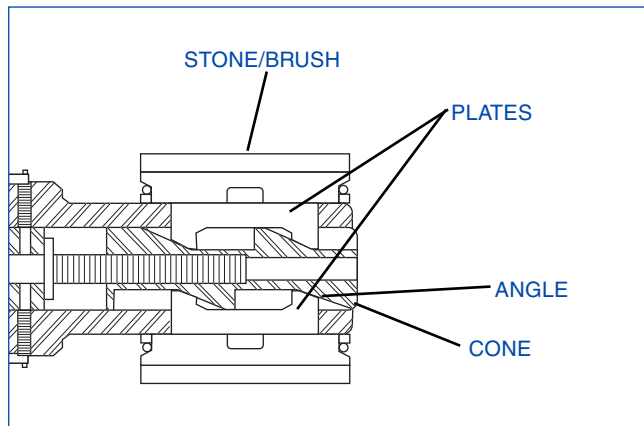


FIGURE 2-13, Install Expander Plates

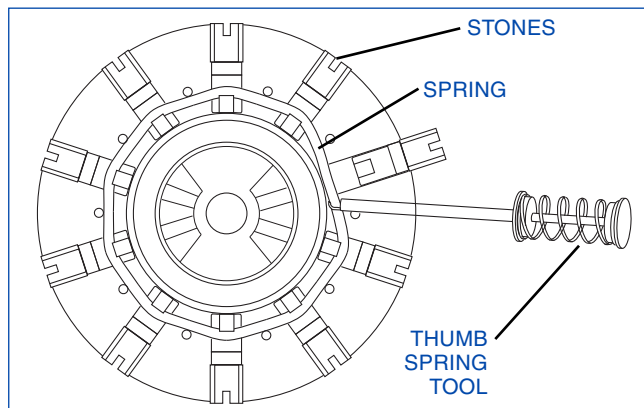


FIGURE 2-14, Install Holders

1. Verify hone head is fully retracted. Both sets of expander plates should be flush against the hone body once inserted into their correct numbered slot.

2. It is easiest to put grouping of stone/brush sets into head at a time, working in a counterclockwise direction, looking down from universal joint (*see Figure 2-14*).

- Grab spring on bottom of hone head, in between mounting clips, and pull it over spring slots in bottom of stone/brush set, using GH-50 Thumb Spring Tool (*refer to Figure 2-14*). Repeat for second set.

- Then, go to top of hone head and pull springs over spring slots in top of stone/brush sets.

3. Proceed to next stone/brush sets and **repeat step 2** until hone head is loaded with all stone/brush sets.

4. Once all stone/brush sets are loaded in head, expand and retract sets in head several times to ensure all moving parts are seated in head properly.

Remove Stone/Brush Sets

When removing stone/brush sets, always remove in sets. To remove and/or replace stone/brush sets, proceed as follows (*refer to Figure 2-14*):

1. Grab spring on bottom of hone head, in between mounted clips and pull it down and away from spring slots in bottom of stone/brush set, using GH-50 Thumb Spring Tool. Repeat for second set.

2. Then, go to top of hone head and pull springs off spring slots in top of same two stone/brush sets.

3. Pull stone/brush sets out of hone head making sure expander plates stay in hone head.

4. Fill empty slots in hone head with new stone/brush sets, and reattach springs.

5. Proceed to next two stone/brush sets and repeat steps.

Truing Stones

Sunnen diamond abrasive honing stones have been pre-ground to a radius and can be used directly from the box. Bore geometry should be monitored as the stones true in.

NOTES

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SECTION 3

SETUP & OPERATION

GENERAL

This section gives step-by-step setup and operating procedures for Sunnen® Vertical Honing Machine.

SAFETY PRECAUTIONS

The following precautions should be observed to ensure maximum safety while working on or around your Machine.

- Wear proper Safety Items (such as safety glasses and other personal safety equipment as necessary or required).
- DO NOT wear loose fitting clothes or jewelry while working on or around Machine.
- Keep area around Machine free of paper, oil, water and other debris at all times.
- Keep Machine and area around machine cleaned of excessive lubricant and lubricant spills.
- Keep tools and other foreign objects clear of Machine while in operation.
- Keep tools clean and in their proper storage compartments to maintain them in proper working condition and to prolong tool life.
- Inspect Tools before using. Check for cracks, burrs or bent parts that might effect operation.
- DO NOT force tools when operating. Tools will do a better and safer job when operated at the rate for which they were designed.
- Turn OFF electrical power when performing service on your machine, which does not require power.
- Disconnect Machine from main power supply and allow drives to drain before any work is performed inside of Electrical Enclosure.
- Ensure all Guards are in place and are in proper working order.
- DO NOT override safety switches or lockouts.

Where interlocking systems rely on special actuators or keys, DO NOT keep spare/master actuators or keys on, around or near machine.

- Use proper lifting procedures when loading and unloading the Machine.
- Keep all non-essential persons clear of work area. Visitors, especially children, should not be permitted near the work area.
- DO NOT use machine for other than its intended use. Using these Machines for other purposes could result in damage to machine and loss of warranty.
- Be sure to work in a well lit area and to use light supplied to avoid dangerous unseen conditions which may exist otherwise.
- Use ONLY factory authorized or recommended parts or replacement accessories. Using parts or accessories other than those approved by Sunnen could result in damage to machine and loss of warranty.
- Electrostatic discharge can damage the circuitry of the electronic components used in this Machine. Use proper electrostatic controls when working with or around electronic components. Ground Machine and use wrist strap to reduce the chances of static discharge.
- Residual Voltage exists for 2-3 minutes after Master ON/OFF Switch is turned OFF. Before working inside Enclosure, wait for all fans to stop running to allow drives to drain.

OPERATING TIPS

If load meter is indicating loads of over 95% consistently, reduce spindle speed. If lowest speed is being used, increase feed rate to break down stone, or use a softer stone. Also verify that “*Rapid Until Load*” is set correctly by reviewing Load graph and observing trend. Remember, if starting load is higher than steady state operating load, result is stone wear without corresponding stock removal.

If honing technique above does not result in greater stone life, use a lower feed rate setting.

If a low operating load accompanies poor stone life, increase spindle speed or use a harder grade stone.

If stock removal rates are too low:

- Increase stroking rate.
- Use a higher feed rate.
- Use a coarser stone.
- Use a harder stone.

If bore is tapered, remove taper by using the dwell feature activated by pushing BLUE dwell button. You can push this button while machine is honing. On RUN screen (inside Bore Profile), there are five marks in middle of screen that represent five locations in bore

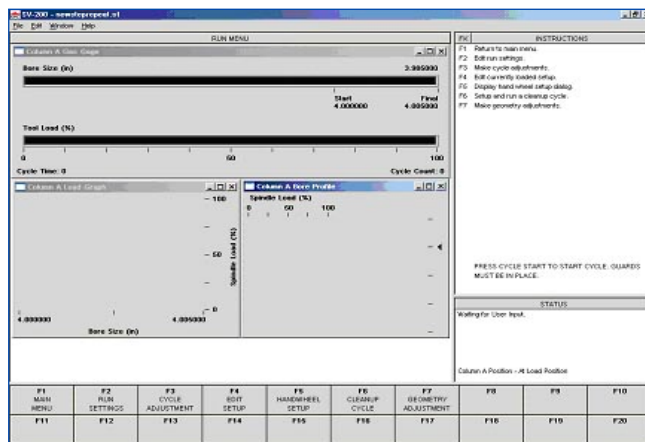


FIGURE 3-1, Run Screen

(see Figure 3-1). Using up and down ARROW keys, you can move this marker to a place in bore that you would like to dwell. When you press dwell button, stroker will dwell for two seconds in location that you selected with arrow keys. This button can be held in to make machine dwell longer.

Tool with Mandrel Adapter

1. If workpiece gets barreled or bellmouthed during honing, first try making adjustments, located in Run Menu, F7-Geometry Adjustments.
2. If workpiece gets bellmouthed during honing, shorten stone only; do not shorten shoe. If workpiece gets barrel shaped during honing, shorten shoe only; do not shorten stone.

CV/CK-Series Hone Heads

1. If workpiece gets barreled or bellmouthed during honing, first try making adjustments, located in Run Menu, F7-Geometry Adjustments.

If hole is bellmouthed, shorten stroke. If hole is barrel shaped, lengthen stroke. If stone becomes tapered, check alignment guides for proper setting. Also check Main guide #3 for taper. If guide is tapered, shorten guide on thick end and place #1 stone in #2 position and vice-versa.

GH-Series Hone Heads

1. If workpiece gets barreled or bellmouthed during honing, first try making adjustments, located in Run Menu, F7-Geometry Adjustments.
2. If hole is bellmouthed, shorten stroke. If hole is barrel shaped, lengthen stroke.

Extra Fine Stones

Finishing stones, 280 grit and finer, are available for applications where a finer finish is required. When these fine grit stones use a conventional or vitrified bond, there is a delicate balance between glazing, which is caused by insufficient stone pressure, and stone crumbling, which is caused by excessive feed rates.

The SV-Series has several features to aid in finding this balance and maintaining consistent honing performance. First of these is "Rapid Until Load" feature, which is found in the setup screen under Feed Prehone, this is located in Run Menu, F4-Edit Setup, F5-Column A Setup. This is percentage of spindle's full load that machine waits to see, before machine stops Rapid advancing and starts to use programmed feed rate. Another feature is Load Meter and its display characteristics. There are three displays that are available to operator. First is BORE PROFILE. This display shows a picture of load vs. stroke position through bore. In most cases it will display condition of bore (i.e., taper, barrel, or bellmouth) during cycle. Second type of display is BAR GRAPH. This display shows a bar graph of machine load as cycle progresses. Last display is LOAD GRAPH. This display will show machine load vs time. Last display will help in optimizing Rapid Until Load (RUL) value. If you use

load graph to determine RUL, ideal condition is to have trend of graph be horizontal. If trend is upward, RUL is too low. If trend is downward, RUL is too high.

SETUP - INITIAL

To set up your machine for operation select "F1-Setup Menu" from Main Menu then select "F2-New Setup." The machine's operating system software will walk you through the setup procedure step by step on the display screen. Follow all instructions carefully.

Special Topics

Controls: See Section 2, Operator Controls

Select & install Tools: See Section 2.

Tool Runout: See Section 2.

Fixture Setup: See separate instructions package with fixtures

Tool & Fixture Alignment: See separate instructions package with fixtures

In preparation for going through the setup sequence, the following preliminary steps can be helpful:

- Install and align any fixturing.

SETUP & OPERATION

Consult the following procedure when setting up your machine for operation. (Machine's control software will walk you through the setup procedure step-by-step on the view screen. Follow all instructions carefully.)

1. Install Workpiece.
2. Release E-stop by turning clockwise and follow instructions on right side of display screen.
3. Press Power ON (white) button. (Drives parameters are being verified.)
4. When instructed, press Cycle Start (green) button.
 - Once Run Menu display screen appears, press F1-Main Menu.
 - Once Main Menu display screen appears, press F1-Setup Menu.
5. Then press F2-New Setup. (A window will pop open telling you "current setup will be cleared.")
 - Press YES to proceed.
6. Follow directions on display screen for entering a new setup:
 - Key in desired value using key pad - Press OK to accept.

START DIAMETER: 3.490000

- Key in desired value using key pad - Press OK to accept.

FINAL DIAMETER: 3.675000

- Key in desired value using key pad - Press OK to accept.

BORE LENGTH: 3.50000

- Select Material - Press OK to accept.

MATERIAL: Tool Steel

- Select Hardness - Press OK to accept.

HARDNESS: 2

7. Press NEXT to continue with setup: (Follow directions on display screen.)

- Select Tool Family – This will display your tool selection options. (Select tool family.)

CV

- Select Tool.

CV-3305A (CK-3035A)

8. Press NEXT to continue with setup: (Follow directions on display screen.)

- Under Honing Options click in the boxes to activate Pre & Post Hone Spindle Rotation. This will activate grayed out buttons to the left.
- Honing Parameters are calculated based on pre-programmed information. Only change these values if necessary.

NOTE: To Change: Click on parameter you wish to change, key in value, and press OK.

9. Press NEXT to continue with setup: (Follow directions on display screen.)

- Under Feed Options clicking in the box will activate Rapid Until Load button to the left and gray out Amount Before Start button.
- Pre-Honing Feed Parameters are calculated based on pre-programmed information. Only change these values if necessary.

10. Press NEXT to continue with setup: (Follow directions on display screen.)

- Select Honing Feed Rate 1, key in 0.02, and press OK.
- Leave Feed Options alone at this time.

11. Press NEXT to continue with setup: (Follow directions on display screen.)

- Under Feed Options click in boxes for Sizing and Sparkout. This will activate the related buttons to the left.
- Leave Crosshatch Options alone at this time.

12. Press NEXT and select install new tool.

13. Press NEXT and follow directions on display screen.

14. Once Tool is installed press NEXT and then press YES on the window that says “Teach Tool Size (Snug).”

15. Set tool SNUG diameter by moving tool around in bore, while using handwheel, expand tool (CW) or retract tool (CCW), until tool feels snug in bore.

16. Press TEACH to set Snug Diameter. Box to right will turn green and display “the snug size is set.”

17. Press NEXT and continue to follow directions on display screen for setting stroke.

18. Under Loading Method select Manual.

19. Press FINISH when stroke is set.

20. Press Yes to save setup.

21. Select location to save file. Name the File. Then Press Save.

22. Press F10 to access Run Menu.

23. Install workpiece in fixture.

24. Press F2, Run Settings.

25. Click on Machine Tab.

26. Toggle ON Coolant (Green).

27. Under Cycle Mode click Single.

28. Press APPLY and then press OK.

29. Close all Guards.

30. Press CYCLE START button and run a honing cycle.

31. Open Guards.

32. Remove and check (gage) workpiece(s).

- To edit: Press F4 Edit Setup. Then press F4 to edit Part Specifications or F5 to edit Column A Setup (Machine).

33. Press OK when finished.


34. Press F10 to return to Run Menu.

35. Load parts.

36. Continue Honing.

SAFE SHUTDOWN (Turning Machine Off)

To turn OFF the Machine properly, ***DO NOT just turn off the disconnect switch.*** Please follow the following steps:

1. Using the Mouse, left click on the  that is located in the upper right corner of the screen.
2. This will display the exit password dialog box. Enter “shutdown” (all lower case) and then click on the OK button.
3. After a few moments, a dialog box will come up on the screen saying that it is safe to turn off the computer. At this time, you can turn off the disconnect switch.

NOTES

This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.

SECTION 4

ROUTINE MAINTENANCE

GENERAL

The following procedures are given as guides only and are not to be construed as absolute or invariable. Each machine must be maintained individually according to its particular requirements.

WARNING

ALWAYS have power OFF when doors are open or performing service not requiring power.

CLEANING

Daily, after use, wipe exterior of the Machine with a clean, dry cloth to remove any coolant, dust and grime. Empty Pail (Magnetic Separator) as required. Monthly, wipe with a clean dry cloth. Then clean the exterior of Machine with warm water and a mild detergent or mild industrial solvent. Rinse thoroughly with clean hot water and wipe dry. Lightly lubricate following lubrication instructions.

LUBRICATION

Inspect Grease Lines and Fittings monthly for leaks or damaged parts. Replace parts as required.

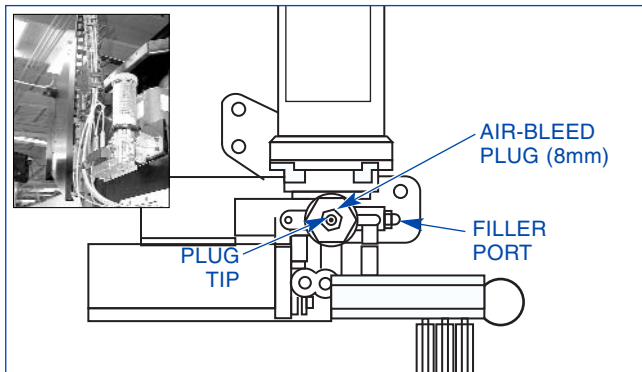


FIGURE 4-1, Grease Lubricating System

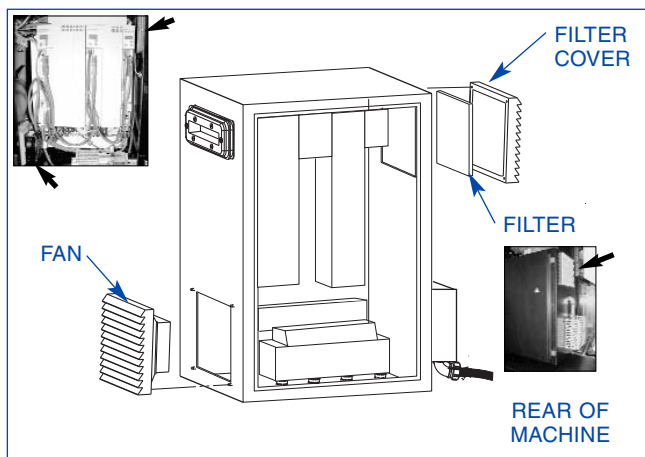


FIGURE 4-2, Air Filter Element

CAUTION

ALWAYS fill grease canister using filling port. Ensure no air is inside grease canister.

Grease Lubricating System

Fill Grease Reservoir with Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent) (*see Figure 4-1*).

Fill grease reservoir through grease fitting with grease gun equipped with air relief valve. It is important to the operation of the grease pump that no air is in the grease reservoir. System is equipped with a Pressure Switch, which flashes a warning on the operator display screen when the level/pressure drops below minimum requirement. To bleed system proceed as follows:

1. Turn ON machine and operate Lubrication Pump.
2. Loosen the air-bleed plug by one turn in the counterclockwise direction, using an 8mm wrench.
3. Air and grease will now emerge from tip of plug.
4. When discharge of grease becomes a continuous flow, stop pump and tighten plug, by turning clockwise.
6. Start pump and confirm that there is no leakage of grease from the air-bleed plug.

ROUTINE MAINTENANCE SCHEDULE

The following procedures and suggested maintenance periods are given as guides only, and are not to be construed as absolute or invariable. Local conditions must always be considered. Each machine must be maintained individually, according to its particular requirements.

Daily:

- If using Coolant System, check coolant level (Gage on front of Coolant System), and add coolant as necessary.

CAUTION

DO NOT overfill system.

- If using Sunnen Coolant Concentrate, check concentration and add water or concentrate as necessary.

Every 1000 Hours:

- Remove the sheet metal covers that are attached to the carriage.

- Verify the operation of the lubrication system as follows: Remove sheet metal covers attached to carriage to get to points where grease lines enter ball screw and ball spline. Disconnect both grease lines at these locations. Under Diagnostics section of software, set lube system to cycle 50 times. Verify that grease is coming out of both grease lines. (There may be some delay in grease coming out of lines. This is normal.) If grease is not coming out of one or both lines, then refer to Machine Operation Troubleshooting section for corrective action.

- Inspect the ball spline and ball screw grooves for pitting or wear. Any sign of this, if it occurs in a region where the machine strokes during the honing cycle, indicates a failure is imminent, and replacement should be planned for the near future.

- Check the tension of the motor and spindle belts. *(See sections on Upper Spindle Belt and Lower Spindle Belt.)*

CAUTION

Both belts can be tensioned with the aid of screws placed in the assembly. These screws are only to assist in belt tensioning. Care must be taken that belts are not over-tightened by attempting to tighten these screws.

- Examine the way covers for breaks or tears. Replace as needed.

Every 10,000 km of Carriage Travel:

NOTE: The control system records cumulative carriage travel. If your application runs at recommended stoker speeds, 10,000 km of travel will be reached after approximately 7000 hours of run time. The operator station will indicate if the limit is close to being reached.

- Grease the x-axis carriage and stoker carriage runner blocks using Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent). The ends of the runner block assemblies have Zerk fittings. Each runner block will need approximately 2.2 ml. .

FILTER ELEMENT REPLACEMENT

Periodically check and clean Filter Element on the side of the Electrical Enclosure, replaced as required. To clean or replace the Filter Element proceed as follows *(see Figure 4-2)*.

1. Turn OFF all power to Machine at Master ON/OFF Switch.
2. Open Door to Electrical Enclosure.
3. Snap Filter Cover off Filter.
4. Remove Filter Element.
5. Clean Filter with warm water and a mild detergent or mild industrial solvent.

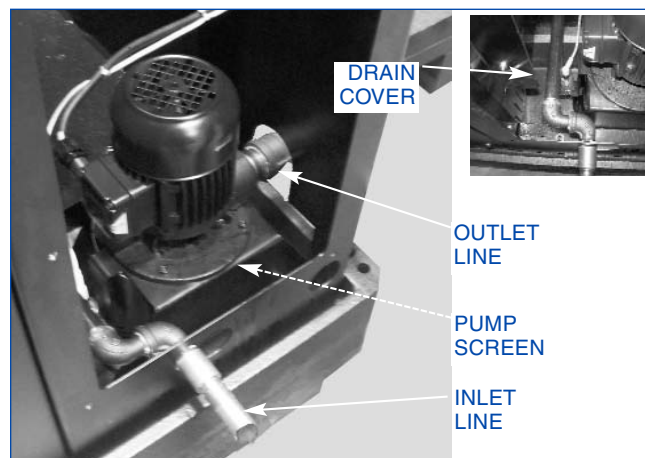


FIGURE 4-3, Sump Pump

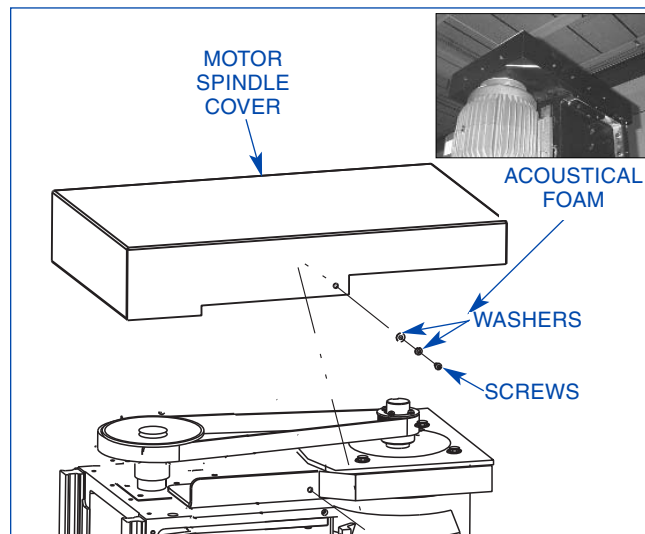


FIGURE 4-4, Motor Spindle Cover

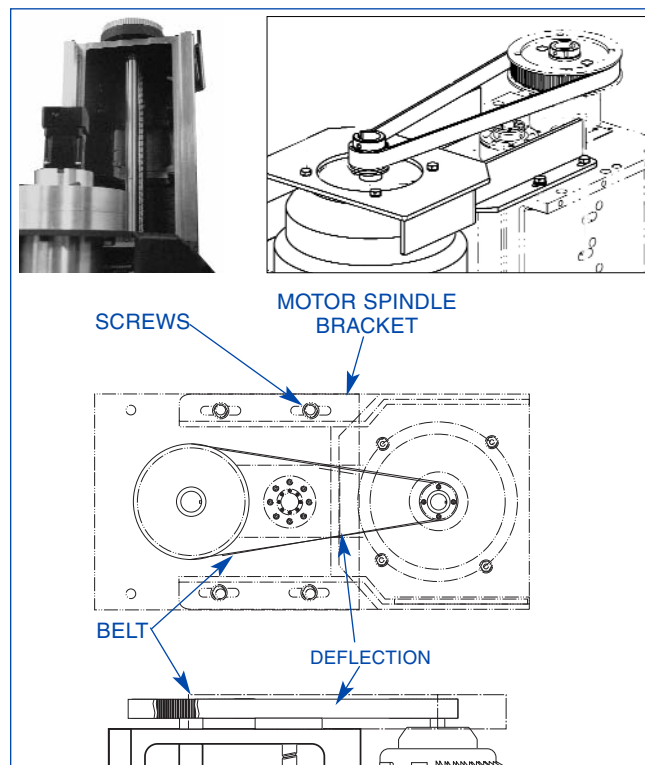


FIGURE 4-5, Upper Spindle Belt

6. Rinse thoroughly with clean hot water and allow to dry.

7. Reinstall Filter Element.

NOTE: Replacement Elements and parts are available through the Sunnen or your local supplier.

8. Snap Filter Cover into place over Filter Element.

9. Close and secure Door.

10. Turn ON power to the machine.

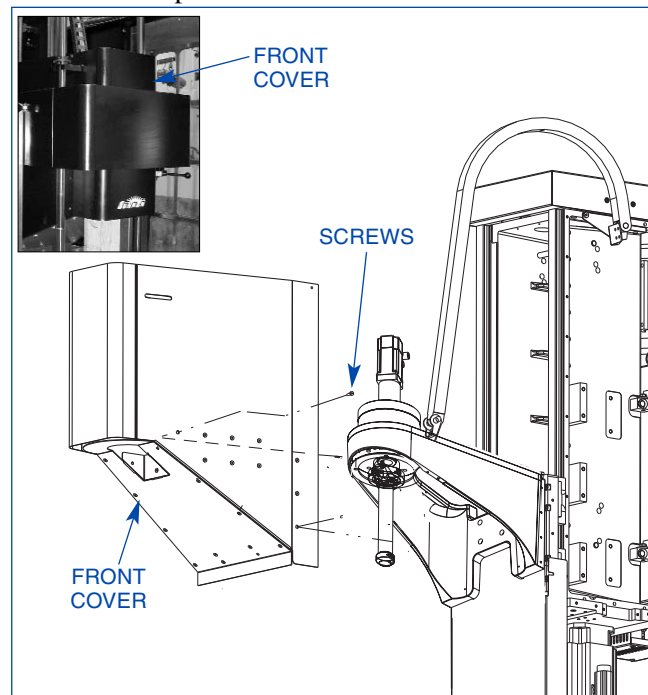


FIGURE 4-6, Front Cover

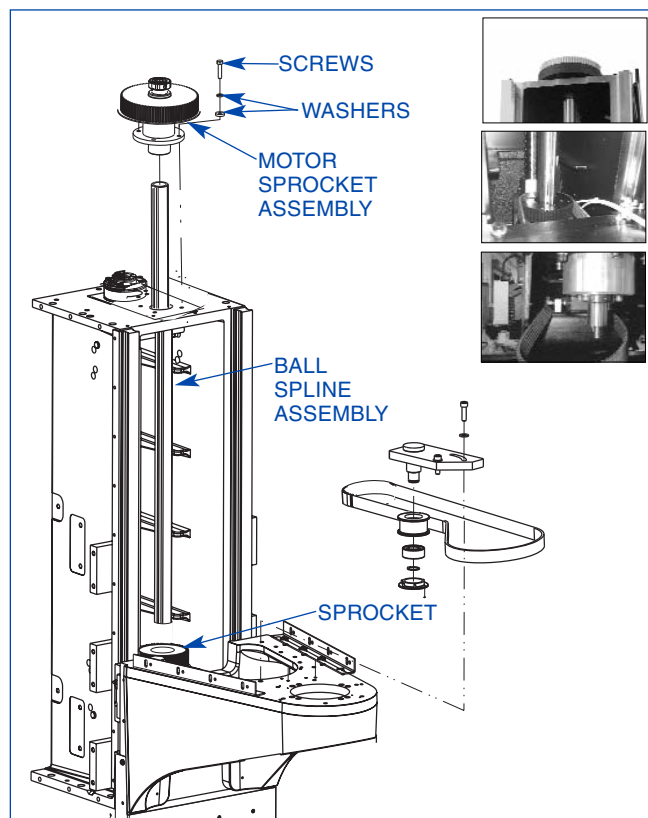


FIGURE 4-7, Lower Spindle Belt

SUMP DRAIN CLEANING

Periodically check and clean Sump Drain (*see Figure 4-3*). Sump Drain should be cleaned when there is a noticeable drop in coolant pressure.

1. Turn OFF power at Master ON/OFF Switch.
2. Remove Drain Cover in right side of machine base, by removing six (6) button socket head cap screws.
3. Remove sludge from sump and pump screen.

UPPER SPINDLE BELT

To replace Upper Spindle Belt, proceed as follows:

1. Remove Screws and Washers securing Motor Spindle Cover, then remove Cover (*see Figure 4-4*).
2. Loosen four (4) Screws holding Spindle Motor Bracket to deck (*see Figure 4-5*).
3. Loosen tension Setscrew in Tension Rod.
4. Slide spindle motor in toward spindle to loosen belt.
5. Remove old belt and replace with new belt.
6. Use tension Setscrew against Bracket to tension belt before tightening Screws on Spindle Motor Bracket. (New Belt: Tension belt so that deflection at midway between pulleys is approximately 7,5mm (.3in) when a 53N (12 lb) load is applied.)

NOTE: Used Belt: Tension belt so that deflection at midway between pulleys is approximately 7,5mm (.3in) when a 40N (9 lb) load is applied..

7. Tighten four (4) Screws holding Spindle Motor Bracket to deck.
8. Reinstall Cover.

LOWER SPINDLE BELT

To replace Lower Spindle Belt:, proceed as follows:

1. Remove Upper Cover (*refer to Figure 4-4*).
2. Loosen four (4) Screws holding Spindle Motor Bracket to deck. Then loosen tension Setscrew in Tension Rod (*refer to Figure 4-5*).
3. Slide spindle motor in toward spindle to loosen Upper Spindle Belt.
4. Remove Front Cover (*see Figure 4-6*).
5. Remove Motor Sprocket Assembly, by removing four (4) Screws and Washers securing assembly to upper Deck by access through top pulley (*see Figure 4-7*).
6. Slide Ball Spline Assembly out of lower Sprocket (*refer to Figure 4-7*). Block upper assembly as required.

7. Loosen tension on Idler Pulley, by loosening tension Screw in Tension Block Assembly (see Figure 4-8).

8. Remove old belt and replace with new belt.

9. Use tension Screw to tension belt. (New Belt: Tension belt so that deflection at midway between pulleys is approximately 9,5mm (.38in) when a 40N (9 lb) load is applied.)

NOTE: Used Belt: Tension belt so that deflection at midway between pulleys is approximately 9,5mm (.38in) when a 29N (6.5 lb) load is applied.

10. Align Ball Spline Assembly with lower Sprocket and reinstall Assembly in Sprocket.

11. Reinstall Motor Sprocket Assembly.

12. Use tension Setscrew against Bracket to tension Upper Belt before tightening Screws on Spindle Motor Bracket. Tension belt so that deflection at midway between pulleys is approximately 7,5mm (.3in) when a 53N (12 lb) load is applied.

13. Tighten four (4) Screws holding Spindle Motor Bracket to deck.

14. Reinstall Front And Upper Covers.

PNEUMATIC LINES CHECK (Optional)

Inspect Pneumatic Lines and Fittings monthly for leaks or damaged parts. Replace parts as required.

Filter Element Replacement

The Filter Element in the Airline Regulator should be cleaned or replaced when there is a noticeable drop in air pressure. To clean or replace the Filter Element proceed as follows (see Figure 4-9).

1. Turn OFF power to Machine at Master ON/OFF Switch, Electrical Enclosure.
2. Turn Red Safety Valve to OFF and disconnect In-Coming Factory airline at Quick-Disconnect.
3. Bleed any trapped air from filter.
4. Remove Bowl Assembly from Unit, by holding down on release Button and rotating Bowl. Lay Bowl aside for reinstallation.

CAUTION

Use care in disassembling to prevent O-Ring from being damaged.

5. Unscrew Baffle; and remove Baffle and Filter Element from Shaft.

6. Wipe Bowl and internal parts clean

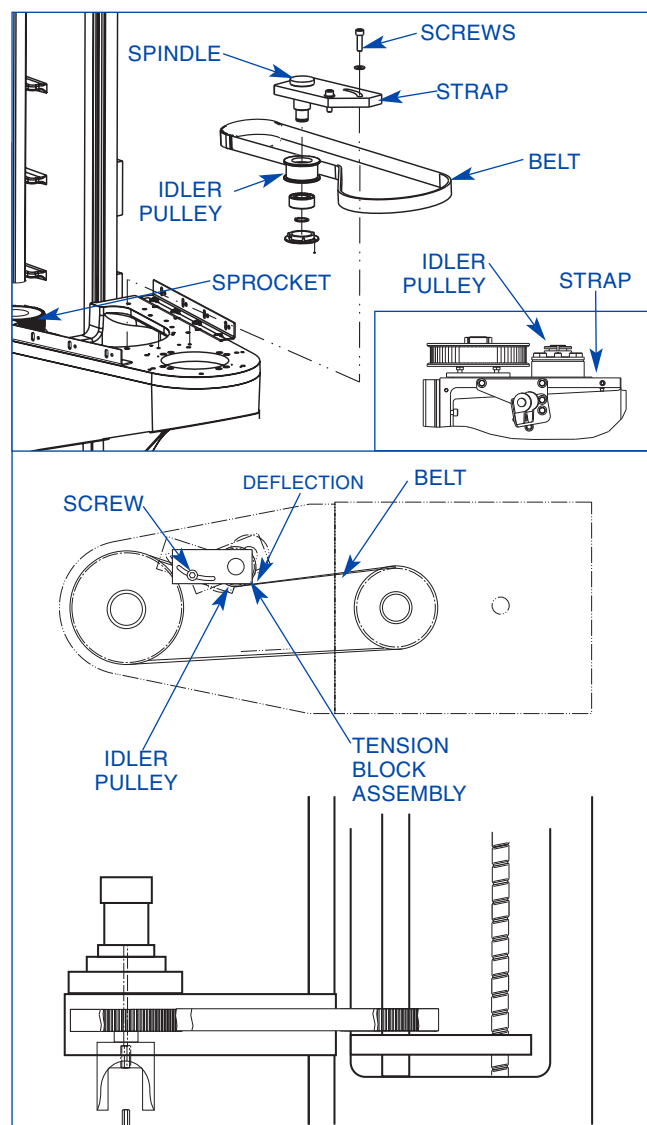


FIGURE 4-8, Lower Spindle Belt Tension

7. Install new Filter Element on Shaft. While holding Filter in place, screw Baffle into place.

NOTE: Use Figure 4-9 to determine what filter is installed on your machine and to determine what replacement elements are needed.

8. Install Bowl Assembly with O-Ring on Unit. Rotate Bowl until Button on side of Bowl snaps into place, locking Bowl into Unit.

9. Connect In-Coming Factory airline at Quick-Disconnect.

10. Turn Red Safety Valve ON.

11. Close top access Cover to the Machine.

12. Turn ON power to the Machine at Master ON/OFF Switch, on Electrical Enclosure.

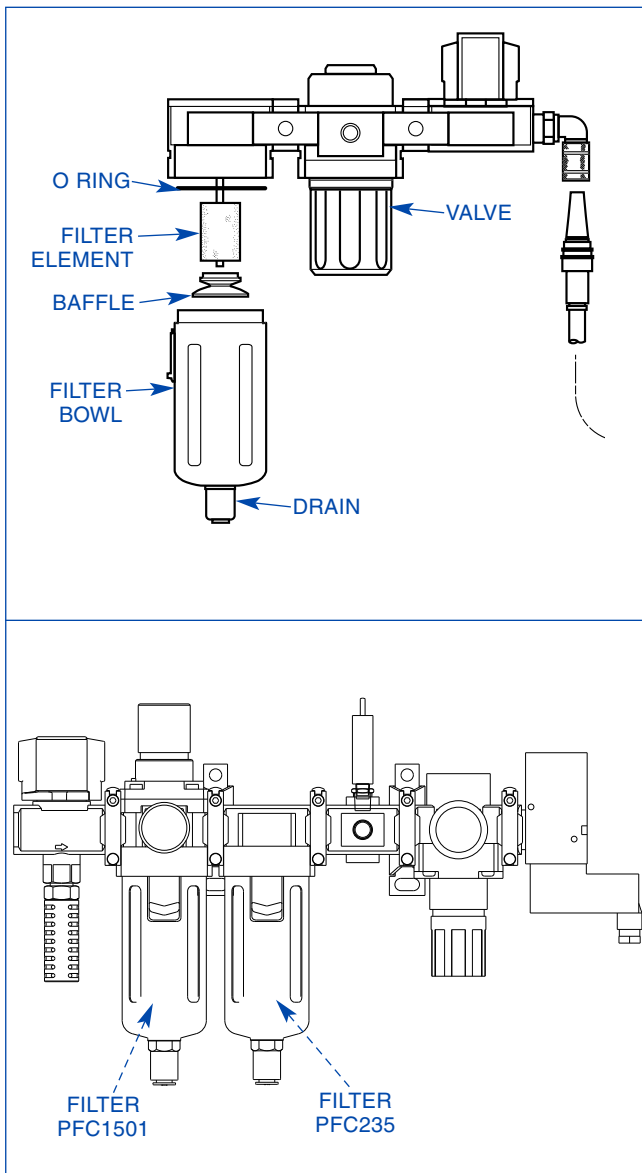


FIGURE 4-9, Pneumatic Line Check

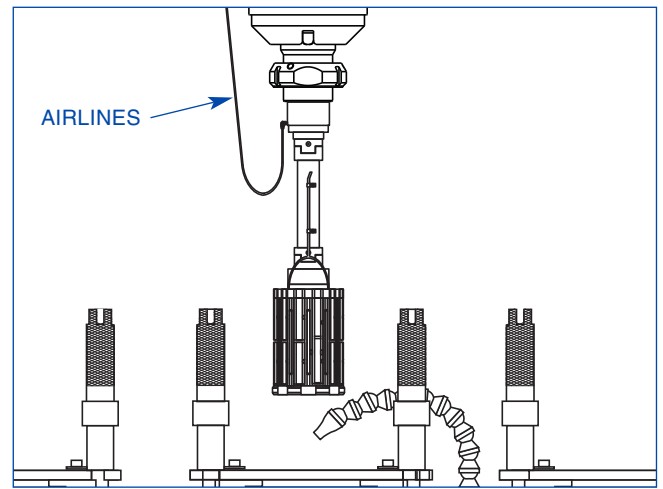


FIGURE 4-10, PH Tooling (Optional)

NOTE: When using Sunnen PH-Series Precision Multi-Stone Honing Tools with integral air gage available for in-process measurement for optimum control of the bore diameter; inspect Pneumatic Lines (airlines) and Fittings running to tool monthly for leaks or damaged parts. Replace parts as required (*see Figure 4-10*).

NOTES

[illegible]

SECTION 5

TROUBLESHOOTING

GENERAL

This section contains Troubleshooting information in table form which should be used when problems occur with machine. The table lists problems encountered, possible causes, and solutions for problems along with reference to section of manual where detailed instructions may be found to correct problems.

OPERATIONAL TROUBLESHOOTING

For suggestions on correcting problems with bore conditions or with honing operation; consult [Table 5-1](#).

TABLE 5-1, Operational Troubleshooting Index

PROBLEM	PROBABLE CAUSE	SOLUTIONS	SEC.	SCREEN
Tool generates high load	1. High feed rate 2. Worn tool 3. Tool Loading (Metal particles on tool surface)	A. Lower feed rate	3	Run / Diagnostic Setup
		A. Replace tool	2	
		A. Dress tool	3	
		B. Increase tool's rpm C. Check coolant*	1	
Tool not cutting	1. Glazing	A. Dress tool	2	Setup
		B. Increase feed rate	3	Run / Diagnostic
		C. Increase stroking speed	3	Run / Diagnostic
		D. Replace tool, use softer grit tool	2	Setup
		E. Check coolant*	4	
Slow stock removal	1. Improper spindle speed 2. Inadequate tool feed rate 3. Improper tool 4. Inadequate tool's rpm 5. Improper or diluted coolant*	A. Increase spindle speed	3	Run / Diagnostic
		A. Increase feed rate	3	Run / Diagnostic
		A. Replace tool	2	Setup
		A. Increase tool's rpm	3	Run / Diagnostic
		A. Check coolant*	4	
Poor stone life	1. Excessive tool feed rate 2. Inadequate tool's rpm 3. Improper tool 4. Improper or dilute coolant* 5. Excessive stock removal 6. Excessive float in tool(s) 7. Worn guide bushings	A. Decrease feed rate	2-3	Run / Diagnostic
		A. Increase tool's rpm	3	Run / Diagnostic
		A. Replace tool	2	Setup
		A. Check coolant*	4	
		A. Decrease stock removal	3	
		A. Decrease tool float	2	Setup
		A. Replace bushings	4	
Bellmouth	1. Short or unbalanced part 2. Improper tool 3. Improper stroke length 4. Excessive float in tool(s) 5. Worn guide bushings	A. Shorten stroke length	3	Run / Diagnostic
		A. Replace tool	2	Setup
		A. Shorten stroke length	3	Run / Diagnostic
		A. Decrease tool float	2	Setup
		A. Replace bushings	4	
Barrel	1. Improper stroke length 2. Improper tool	A. Shorten stroke length	3	Run / Diagnostic
		B. Increase stroke length	3	Run / Diagnostic
		C. Replace tool	2	Setup
		A. Replace tool	2	Setup

*NOTE: Many honing problems, such as poor tool life and rough finish, are caused by the following: the wrong coolant, insufficient coolant, dirty coolant, or contaminated coolant. Use ONLY clean, full-strength Sunnen Industrial Honing Oils or Water-Based Coolants. DO NOT dilute or "cut" the oil or coolant in your Machine with other oils or coolants. Keep solvents and cleaning fluids away from your Machine.

TABLE 5-1, Operational Troubleshooting Index (cont'd)

PROBLEM	PROBABLE CAUSE	SOLUTIONS	SEC.	SCREEN
Taper in Open Hole	1. Improper overstroke	A. Lengthen overstroke on tight end	3	Run / Diagnostic
	2. Workpiece and Spindle not aligned	A. Align Workpiece and Spindle	3	Run / Diagnostic
	3. Part/tool geometry	A. Readjust stroke position	3	
Taper in Blind Hole	1. Improper stroke length	A. Increase stroke length	3	Run / Diagnostic Setup
	2. Inadequate relief in blind end	A. Provide sufficient relief	3	
		B. Short stroke tight end C. Replace tool	2	
	3. Inadequate oil flow	A. Adjust Oil Nozzle		
Out-Of-Round	1. Undersize honing tool 2. Workpiece flexing (thinwall)	A. Replace tool	2	Setup
		A. Decrease feed rate	3	Run / Diagnostic
		B. Change method of fixturing	2	Run / Diagnostic
		C. Decrease spindle speed	3	
	3. Improper tool 4. Excessive float in tool(s) 5. Fixture not properly Aligned	D. Reduce stock removal A. Replace tool	2	Setup
		A. Decrease tool float	2	Setup
A. Adjust Fixture		2	Setup	
Waviness	1. Improper tool length	A. Use tool with sufficient stone length to bridge waviness in bore	2	Setup
Rainbow	1. Improper tool length	A. Replace tool (tool length should be 1-1/2 times bore length)	2	Setup
	2. Improper overstroke	A. Shorten overstroke	3	Run / Diagnostic
	3. Improper tool	A. Replace tool	2	Setup
Rough Finish	1. Improper feed rate	A. Decrease feed rate	3	Run / Diagnostic Setup
	2. Improper tool	A. Replace tool	2	
	3. Material loading tool	A. Inspect & clean		
	4. Improper or diluted coolant*	A. Check coolant*	4	
Scratches in Bore (Random)	1. Improper feed rate	A. Decrease feed rate	3	Run / Diagnostic Setup
	2. Improper tool	A. Replace tool	2	
	3. Improper or diluted coolant*	A. Check coolant*	4	
*NOTE: Many honing problems, such as poor tool life and rough finish, are caused by the following: the wrong coolant, insufficient coolant, dirty coolant, or contaminated coolant. Use ONLY clean, full-strength Sunnen Industrial Honing Oils or Water-Based Coolants. DO NOT dilute or “cut” the oil or coolant in your Machine with other oils or coolants. Keep solvents and cleaning fluids away from your Machine.				

MACHINE OPERATION TROUBLESHOOTING

Error Messages:

The SV Series Machines have built in error messages that will appear on display screen to alert operator when machine has stopped due to an error, problem, or incorrect setup.

Problems / Solutions:

WARNING

Some troubleshooting procedures require examining parts inside machine enclosure. ALWAYS have power OFF when guards are open. If problem cannot be diagnosed by Power Off inspection, then consult a Sunnen Service Technician.

PROBLEM: Control system gives a message indicating that the grease system is out of grease, but grease can still be seen in the reservoir.

SOLUTIONS:

- An air pocket in the grease system can cause this fault. Use the following procedure to bleed the air from the system:

1. Disconnect all grease lines from their grease injectors.
2. Remove all the grease injectors from the manifold.
3. In the Diagnostics section of the control software, set the grease system to cycle 100 times.
4. Watch the open ports in the manifold. As soon as grease comes out an open port, then install that injector in the open port.

NOTE: If you cannot hear the grease pump cycling, then either the pump is defective or there is a loose electrical connection.

5. When all injectors are installed begin looking for grease to come out of the injectors. As soon as grease can be seen coming out of an injector then connect a grease line to that injector.
6. After all grease lines have been reconnected, allow the system to finishing the 100 cycles. If no faults occur in those 100 cycles then the air has been successfully bled out of the system.

PROBLEM: Routine inspection of lubrication system shows that grease is not coming out of one or more grease lines.

SOLUTIONS:

- Remove the grease lines from the tops of the grease injectors. Under the Diagnostics section of the software, set the lube system to cycle 50 times.

1. If grease is seen coming out of the injectors, then the problem is with the grease line. It is either clogged or has a leak. In either case it should be replaced.
2. If grease is not seen coming out of one or more injector, then remove the injector(s) from the manifold. Is grease coming out of the manifold port(s) as the system continues to cycle? If not then proceed to step 5.
3. If grease is coming out of the port(s) then reinstall the injector(s). Only reinstall an injector into a port where grease is present. If air is trapped below the injector it will not work properly.
4. If grease does not come out of the reinstalled injector, then the injector is not working properly. An injector may be disassembled and cleaned to get it to resume working, if that does not work then the injector is defective and should be replaced.
5. If grease is not seen coming out of the port(s) when the injectors are removed then air must be bled from the grease pump. Open the air bleed port just below the grease reservoir and continue cycling the system until grease can be seen coming out of the port. If this does not happen then the pump is defective.
6. After taking the necessary corrective action and reassembling, but before reattaching the grease lines to the ball screw and ball spline, cycle the lube system 50 times and verify that grease is coming out of the lines.

NOTES

[illegible]

A - COOLANT SYSTEM (OPT) FLOW DIAGRAM

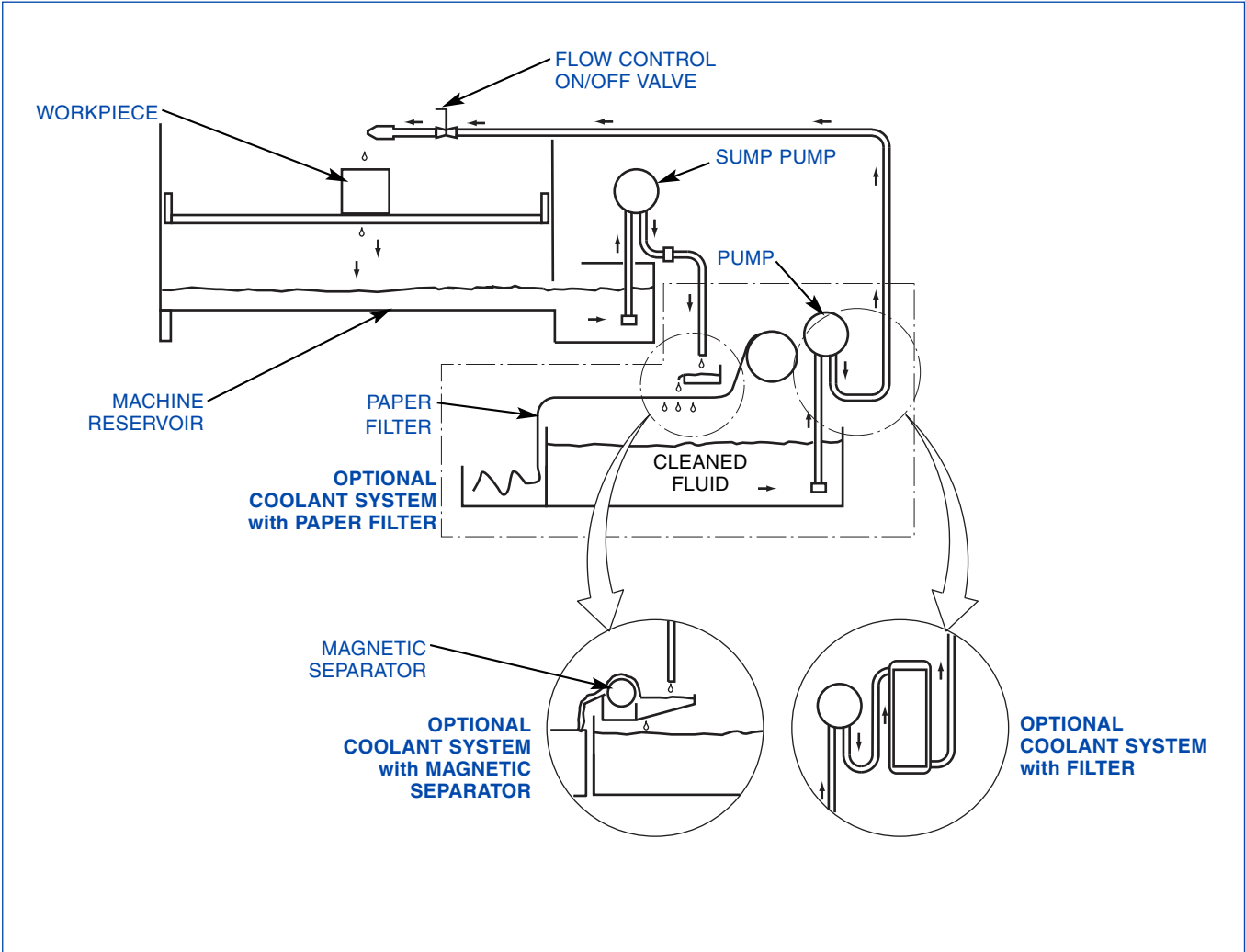
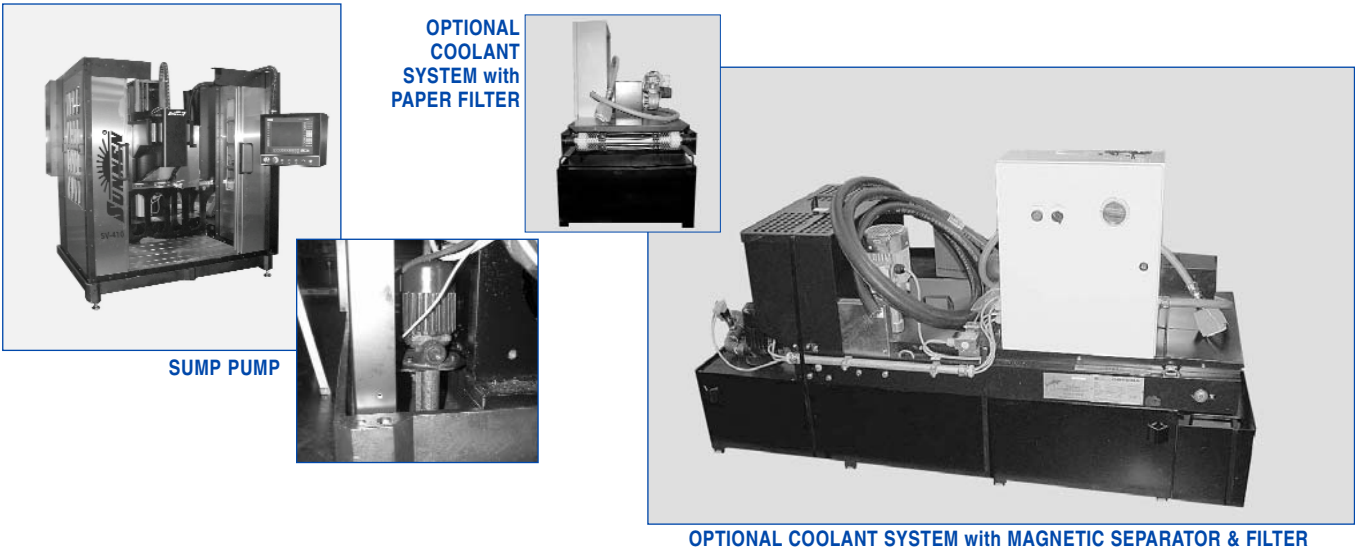


FIGURE A-1, Coolant System Flow Diagram

NOTES

[illegible]

B - GREASE LUBRICATION SYSTEM FLOW DIAGRAM

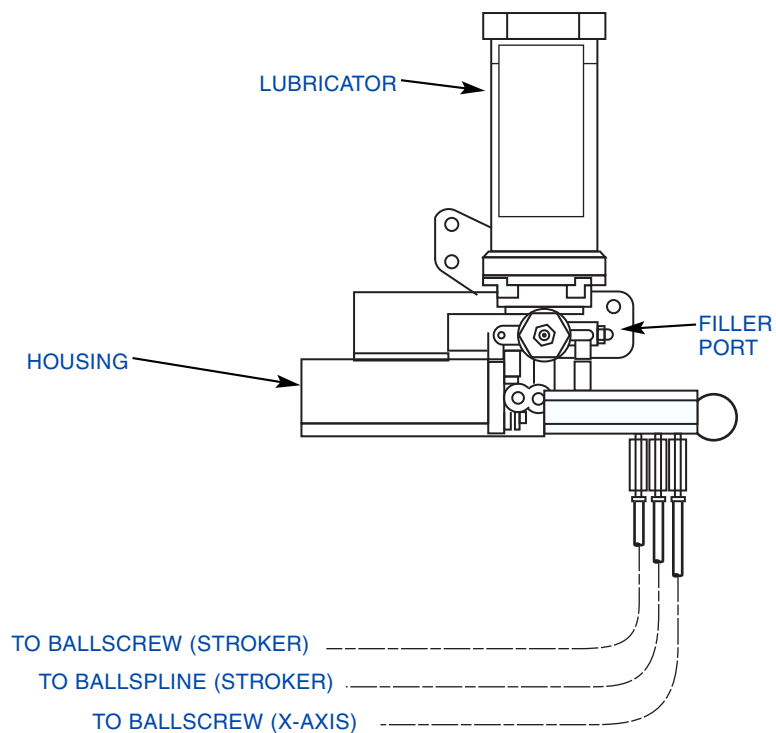
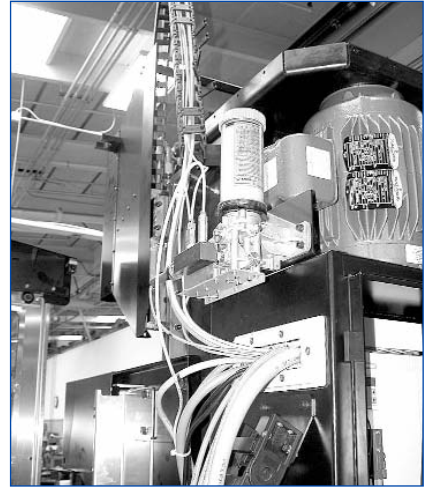
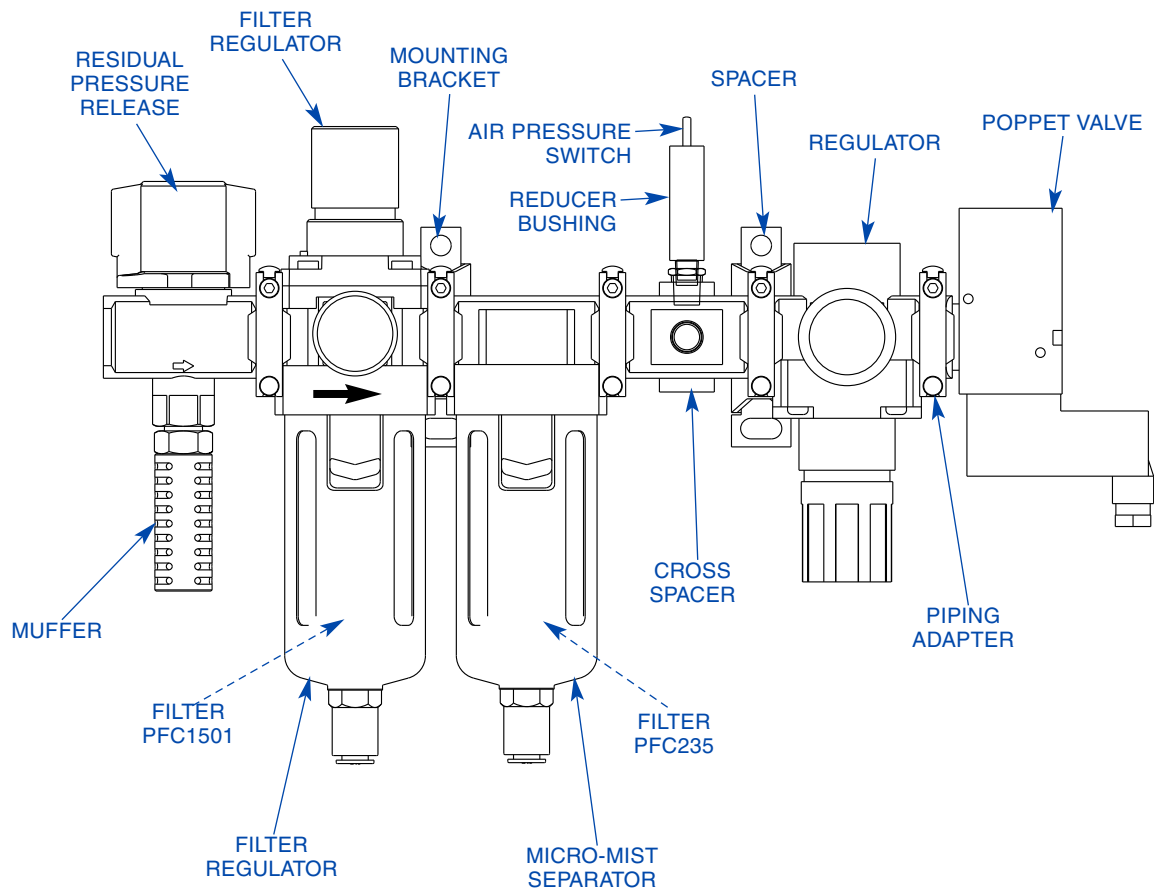
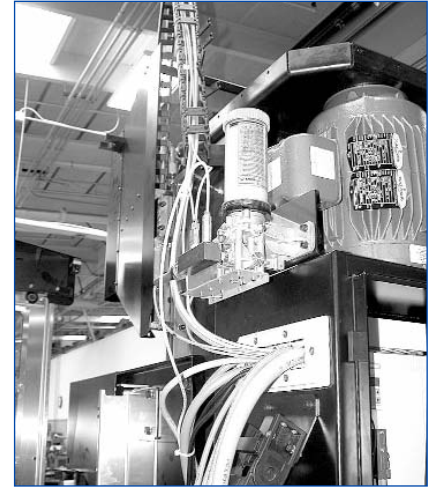
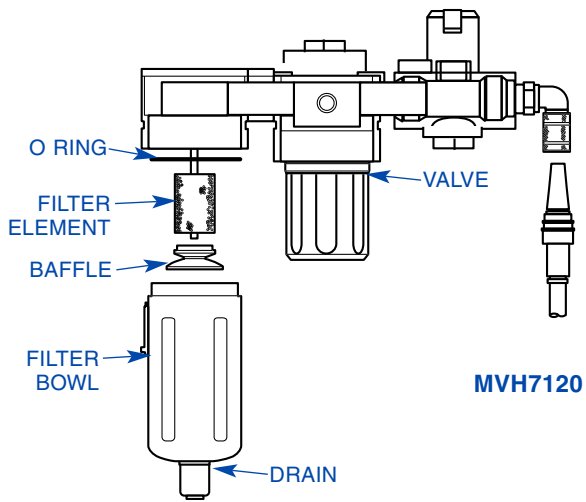


FIGURE B-1, Grease Lubrication System Flow Diagram

NOTES

[illegible]

C - OPTIONAL PNEUMATIC SYSTEM FLOW DIAGRAM



SV07005

FIGURE C-1, Optional Pneumatic System

NOTES

[illegible]

APPENDIX D

DECLARATION OF CONFORMITY (CE)



EC declaration of conformity

according to the EU Machinery Directive 2006/42/EG, Annex II, 1.A

Manufacturer:

Sunnen Products Co.,
7910 Manchester
63143 St. Louis, Missouri USA

Person residing within the Community authorised to compile the relevant technical documentation:

Julian Hooper
Sunnen Products Ltd.,
Centro 1 Maxted Rd
HP2BL Hemel Hempstead, Hertfordshire

Description and identification of the machinery:

Make: SV-410 Vertical Honing Machine
Serial no: XXXX

It is expressly declared that the machinery fulfils all relevant provisions of the following EU Directives:

2006/42/EG:2006-05-17	EU Machinery Directive 2006/42/EG
2004/108/EG:2004-12-15	Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

Reference to the harmonised standards used, as referred to in Article 7(2):

EN 60204-1:2006	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
-----------------	---

SAMPLE
CE DOCUMENT

St. Louis, Missouri USA, 2011.11.21

Place, date

Signature
Michael C. Haughey
Chief Operating Officer

NOTES

This image shows a full page of blank, lined paper. It features approximately 28 horizontal ruling lines spaced evenly across the page, typical of standard notebook paper. The lines are thin and light gray or blue. There is no handwriting, printed text, or other markings on the page.



WARNING

An Arc Flash Hazard Exists. Follow safe work practices and wear appropriate Personal Protective Equipment. Follow proper lockout/tagout procedures. Failure to comply can result in death or injury.

Like any machinery, this equipment may be dangerous if used improperly. Be sure to read and follow instructions for operation of equipment.

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING UNITED STATES PATENTS

4,428,160	5,022,196	5,234,295	5,443,417	6,780,084
4,796,363	5,178,643	5,243,792	5,663,886	7,371,149
4,809,440	5,185,969	5,255,476	5,707,278	7,575,502
4,866,855	5,209,615	5,390,448	6,074,282	7,727,051
4,993,189	5,222,625	5,433,656	6,527,620	8,277,280

OTHER U.S. AND FOREIGN PATENTS PENDING



SUNNEN PRODUCTS COMPANY, ST. LOUIS, MO U.S.A.

11A1015M / 11043/11

FRACTION / DECIMAL / MILLIMETER EQUIVALENTS CHART

INCH			INCH			INCH		
FRACTION	DECIMAL	MILLIMETER	FRACTION	DECIMAL	MILLIMETER	FRACTION	DECIMAL	MILLIMETER
....	.003937	0,1000	9/32	.281250	7,1438	21/32	.656250	16,6688
....	.007874	0,2000	19/64	.296875	7,5406	....	.669291	17,0000
....	.011811	0,3000	5/16	.312500	7,9375	43/64	.671875	17,0656
1/64	.015625	0,3969	....	.314961	8,0000	11/16	.687500	17,4625
....	.015748	0,4000	21/64	.328125	8,3344	45/64	.703125	17,8594
....	.019685	0,5000	11/32	.343750	8,7313	....	.708661	18,0000
....	.023622	0,6000	....	.354331	9,0000	23/32	.718750	18,2563
....	.027559	0,7000	23/64	.359375	9,1281	47/64	.734375	18,6531
1/32	.031250	0,7938	3/8	.375000	9,5250748031	19,0000
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....	.039370	1,0000	13/32	.406250	10,3188	25/32	.781250	19,8438
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5/64	.078125	1,9844	7/16	.437500	11,1125	13/16	.812500	20,6375
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7/64	.109375	2,7781472441	12,0000	27/32	.843750	21,4313
....	.118110	3,0000	31/64	.484375	12,3031	55/64	.859375	21,8281
1/8	.125000	3,1750	1/2	.500000	12,7000	....	.866142	22,0000
9/64	.140625	3,5719	....	.511811	13,0000	7/8	.875000	22,2250
5/32	.156250	3,9688	33/64	.515625	13,0969	57/64	.890625	22,6219
....	.157480	4,0000	17/32	.531250	13,4938	....	.905512	23,0000
11/64	.171875	4,3656	35/64	.546875	13,8906	29/32	.906250	23,0188
3/16	.187500	4,7625	....	.551181	14,0000	59/64	.921875	23,4156
....	.196850	5,0000	9/16	.562500	14,2875	15/16	.937500	23,8125
13/64	.203125	5,1594	37/64	.578125	14,6844	....	.944882	24,0000
7/32	.218750	5,5563	....	.590551	15,0000	61/64	.953125	24,2094
15/64	.234375	5,9531	19/32	.593750	15,0813	31/32	.968750	24,6063
....	.236220	6,0000	39/64	.609375	15,4781	....	.984252	25,0000
1/4	.250000	6,3500	5/8	.625000	15,8750	63/64	.984375	25,0031
17/64	.265625	6,7469	....	.629921	16,0000	1	1.000000	25,4000
....	.275591	7,0000	41/64	.640625	16,2719	1-1/16	1.062500	26,9880

FORMULAS:

MULTIPLY BY TO GET
 INCHES (in) x 25.4 = MILLIMETERS (mm)
 FEET (ft) x 0.3048 = METERS (m)

MULTIPLY BY TO GET
 MILLIMETERS (mm) x 0.03937 = INCHES (in)
 METERS (m) x 3.281 = FEET (ft)

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